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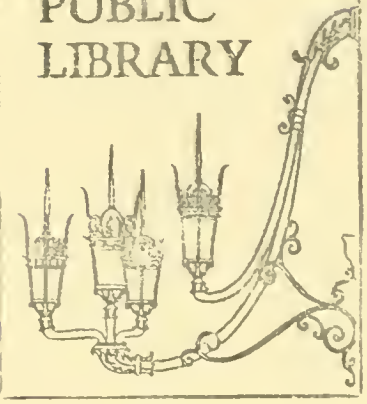

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International Place at Fort Hill Square

Wind Tunnel Study of International Place, Boston

Part 2: Quantitative Pedestrian Flow Analysis

May 1984

Submitted to:

Boston Redevelopment Authority

THE CHIOFARO Company

South Station
P478
1984

WIND-TUNNEL STUDY OF

INTERNATIONAL PLACE, BOSTON

PART 2: QUANTITATIVE PEDESTRIAN FLOW ANALYSIS

by

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May 1984

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CER83-84JAP-JEC356

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1. INTRODUCTION

The Chiofaro Company has retained the authors of this report to study the potential pedestrian level wind impacts associated with the development of International Place at Fort Hill Square. The wind studies have been undertaken in two parts. Part 1, which was completed in March 1984, documented Pedestrian Flow Visualization Testing. The Part 1 Studies had six objectives:

1. Provide general conclusions on the nature of the wind environment in the project site area.
2. Describe, qualitatively, the nature and locations of project-related changes in the wind environment.
3. Test the relative difference in wind environment associated with various phases of project development.
4. Compare qualitatively the wind environment at the International Place site to wind conditions adjacent to other tall buildings in Boston.
5. Investigate potential for affecting local dispersion of air pollutants, and
6. Select the ground level locations from which the detailed, quantitative wind tunnel data would be recorded in the subsequent Part 2 wind tunnel modeling effort.

The objectives of part one were accomplished through "smoke test" observations of flow patterns in the wind tunnel under a variety of wind speeds and directions.

This report is Part 2 of the pedestrian level wind studies. The purpose of Part 2 is to present the results of the quantitative analysis that has been undertaken based upon the results of Part 1. Numerical analysis of

median wind speeds and effective gust velocities for the pre-construction, Phase I and Phase II configurations of International Place has been undertaken in the Colorado State University (CSU) wind tunnel. Statistical representations of pedestrian level wind velocities were obtained at approximately 50 receptor locations, about the project site, selected based upon Part 1 results. The receptor site locations chosen are depicted in Figures 1 through 3. The numbers of test sites chosen, by site configuration, are as follows:

PRE - Preconstruction configuration, 47 locations (see Figure 1) plus a calculated open-country site.

PH1 - Phase 1 (south) tower and a portion of the enclosed courtyard, 50 locations (see Figure 2).

PH2 - Complete project including south tower, north tower and lowrise structure, 47 locations (see Figure 3).

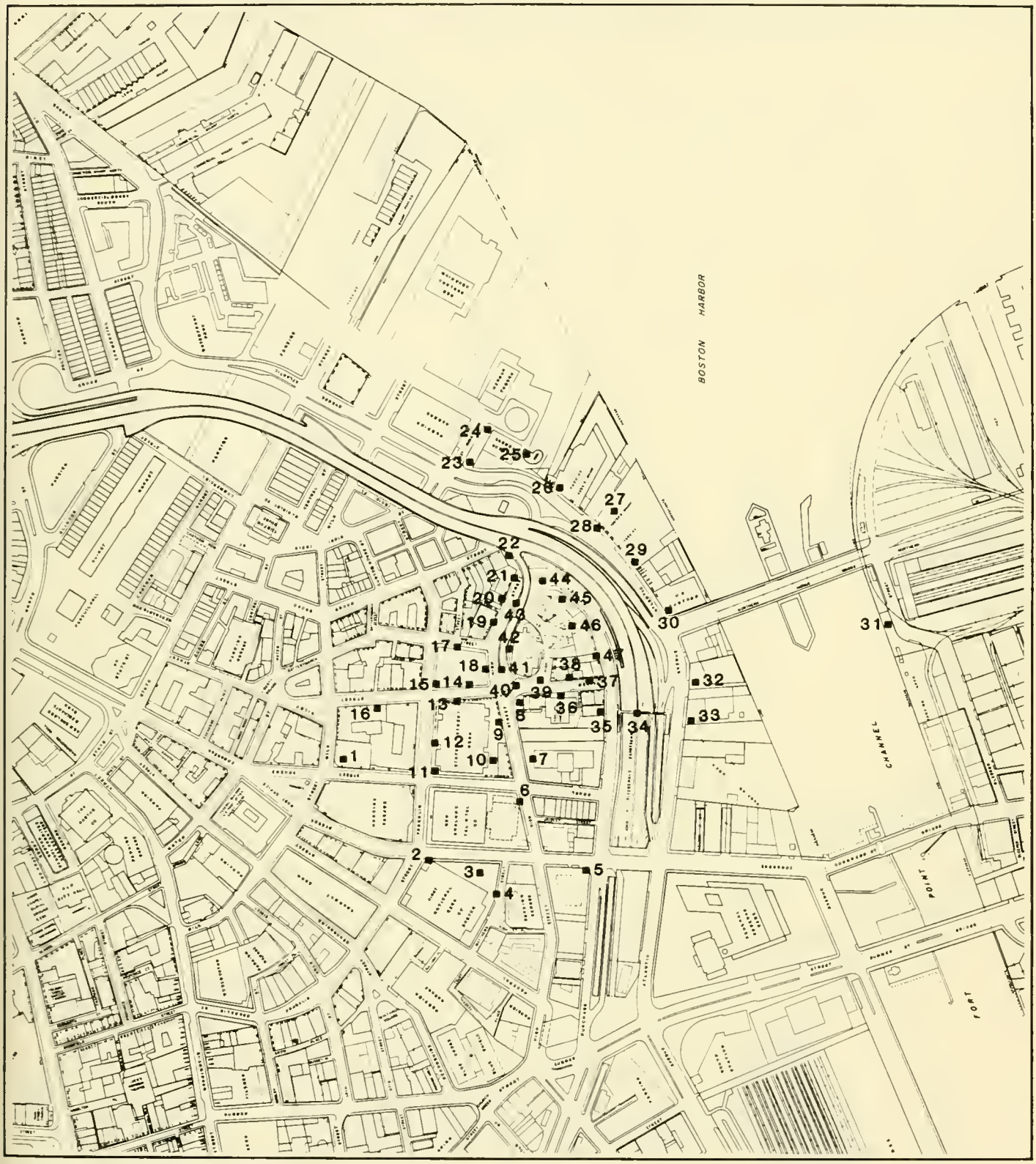
The results of the quantitative wind tunnel modeling at these receptor sites have been recorded and compared to the ambient wind environment in Boston, to existing wind levels at other existing sites in the financial district, and to the informal BRA wind design guidance level (effective gust velocity exceeded 1% of the time $\leq$ 31 mph).

2. SUMMARY OF RESULTS

Based upon the exhaustive wind tunnel modeling analysis the authors have arrived at several conclusions. Among the more salient points are the following:

- Boston is an extremely windy city. Effective gust velocities exceeded one percent of the time, even in open areas not influenced by adjacent high-rise

Figure 1. Pedestrian Velocity Measurement Locations for Configuration PRE



International Place at Fort Hill

HMM Associates
Concord, MA

Figure 2. Pedestrian Velocity Measurement Locations for Configuration PH1

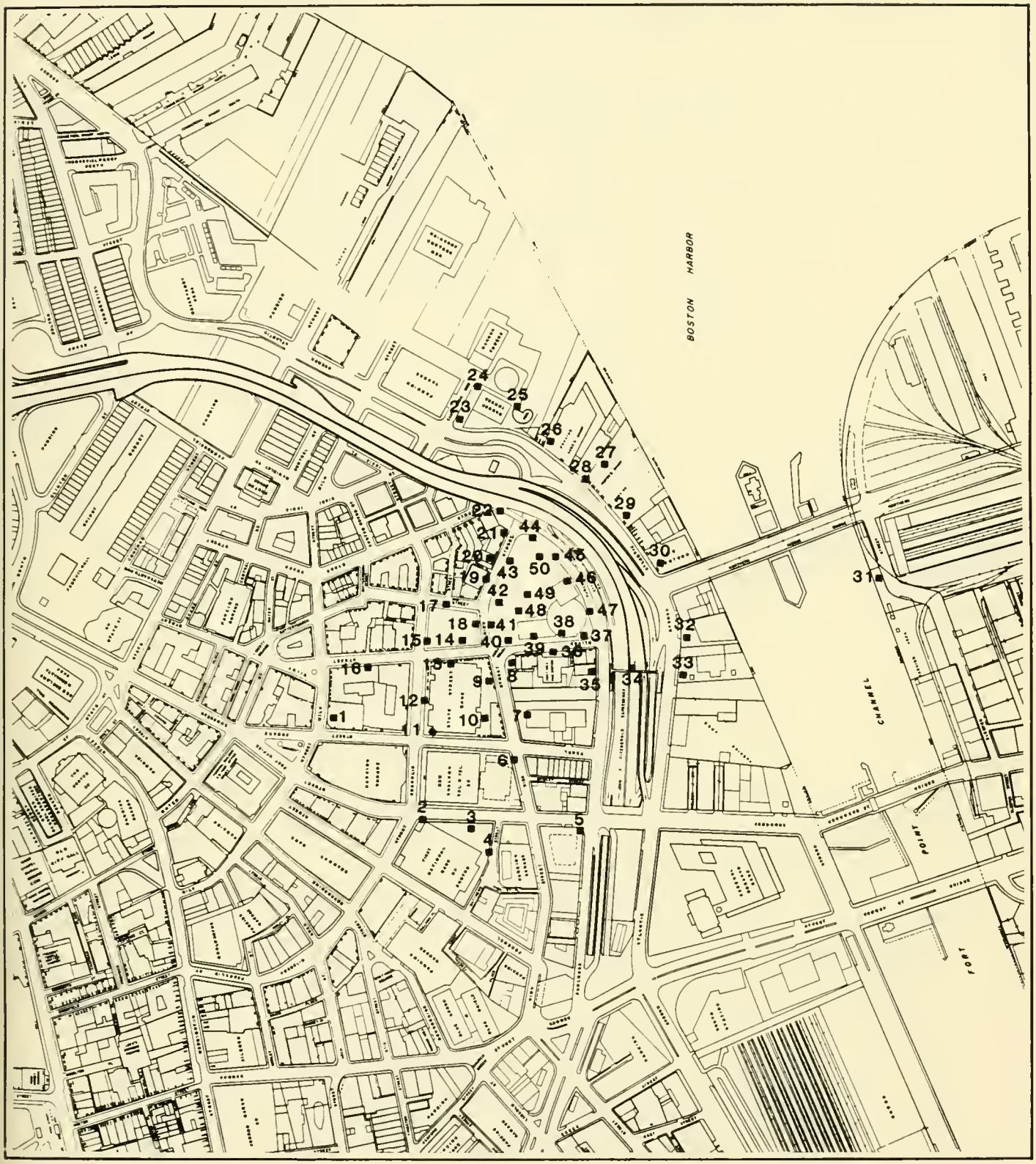


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Figure 3. Pedestrian Velocity Measurement Locations for Configuration PH2

International Place at Fort Hill

HMM Associates
Concord, MA

structures (such as locations similar to Piers 1, 2, 3, and 4 and Logan Airport), are 30 mph. Since the City's informal wind design guidance criterion is 31 mph small changes in the natural wind field can result in exceedances of the criterion. Accordingly care must be taken in applying the informal wind design guidance, and in interpreting the significance of wind levels in Boston.

- Existing wind velocities at six of the 47 PRE receptor locations exceed the informal wind design guidance level. The highest of these is 49 mph, which is well above the 31 mph city design guidance criterion. These areas of elevated pedestrian wind levels reflect Boston's high ambient wind levels and the effects of existing high-rise construction. These receptor locations include:

  #2 Franklin/Congress @ 36 mph
  #24 Harbor Towers Site @ 37 mph
  #25 Harbor Towers Site @ 36 mph
  #32 Atlantic Avenue @ 49 mph
  #33 Atlantic Avenue @ 33 mph
  #34 Expressway/Pedestrian Bridge @ 34 mph

- The introduction of International Place affects local wind environment in a complex manner. There are increases and decreases in wind speed, and areas in which no change takes place. The presence of International Place (full Build) generally increases wind speeds immediately adjacent to the project site. However, in all but two cases the modeled wind speeds do not exceed the City's informal wind design guidance criterion. The exceptions are:

#37 Oliver Street, where effective gust velocity is 34 mph, only 3 mph above the design guidance criterion and 4 mph above the ambient Boston wind levels.

#38 Oliver Street, where effective gust velocity is 35 mph, 4 mph above the design guidance criterion and 5 mph above ambient.

- The introduction of International Place decreases wind levels at eleven locations. Sites #33 and #34, Atlantic Avenue and the pedestrian bridge above the expressway, were brought from PRE levels above the City design guidance criterion (33 mph and 36) to levels at or near the 31 mph criterion.

  - One wind hot spot stands out in the analysis. It is location #32, on Atlantic Avenue, east of the International Place site. Its PRE, PH1 and PH2 effective gust levels are 49 mph, 47 mph and 53 mph respectively. These troublesome levels exist with or without the project. The project has relatively little effect on the elevated winds here.

These points demonstrate that the International Place site is fairly representative of the wind environment in Boston. The introduction of International Place (full Build) will alter the effective gust velocities primarily on the streets and sidewalks immediately abutting the site. At these locations winds will be increased, but the expected increases result in acceptable conditions for pedestrian level activity. No passive recreation areas are affected and the streets remain suitable for pedestrian traffic.

The changes in wind speeds are consistent with the types and magnitude of changes one should expect at an exposed location in a windy city. The design has no unique characteristics which exaggerate pedestrian level winds. On the contrary, the wind tunnel results indicate the smooth cylindrical shapes of the high rise elements help minimize potential for increases in pedestrian level winds.

Therefore, test results lead to a conclusion that predicted pedestrian winds resulting from International Place are not excessive for Boston, and should not create an unpleasant pedestrian environment.

3. MEASUREMENT APPROACH AND RESULTS

Pedestrian velocity measurements were made in the same boundary layer wind tunnel used for the flow visualization study* (see Figure B.1). Three approach boundary layers were established to represent the three different upstream approach roughness categories typical of Boston. The target boundary layers (defined as "A", "B", and "C"), and their azimuthal ranges, are given in Appendix B. Measurements of the boundary layer characteristics are described in Appendix B showing that the target approach boundary layers were achieved. Appendix B also shows vertical profiles of wind velocity at the project site in the PRE configuration.

Mean and root-mean-square (RMS) wind velocities were measured at each pedestrian location in each of the three

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* Peterka, J.A. and J.E. Cermak, Wind Tunnel Study of International Place, Boston, Part 1: Pedestrian Flow Visualization, CSU Project 2-958200, March 1984)

configurations for 16 wind directions. This data represents 2320 individual measurements. Non-dimensional wind velocities were utilized by dividing by the wind tunnel reference velocity (V_{inf}) at 900 ft. This reference velocity was at gradient level for boundary layer "A", (see Appendix B) and somewhat below gradient for boundary layers "B" and "C".

Mean, RMS and effective gust (mean plus 1.5 RMS) velocities are shown as percentages of the reference velocity (V_{inf}) in Table 2 and the Figures of Appendix C.

One location in particular needs explanation. Location 48 in the PRE configuration was not a measured location, but represents a theoretical "open space" location with a mean velocity of

$$\left(\frac{6}{900}\right)^{0.16} \quad x \quad 100 \text{ percent of } V_{inf}$$

This is the mean velocity at 6 feet in a 0.16 power law boundary layer (similar to boundary layer "A"). An RMS velocity of 11 percent of V_{inf} was selected as a typical measured value in open country. This theoretical pedestrian location was included for reference purposes and to show typical wind velocities of unobstructed flow for Boston.

Table 2 and Appendix C show that the highest mean velocities, for all three configurations, as a percentage of the mean velocity at 900 feet (V_{inf}), were measured at location 24 at the base of the Harbor Towers northeast of the project site. These values ranged from 86 to 90 percent of V_{inf}. In the PRE configuration, locations 33, 25, 32 and 2 (all away from the project site) had mean velocities greater than 70 percent of V_{inf} for at least one wind direction. With the inclusion of International

Place, locations 37, 38, 40, 41, 44 and 45, immediately about the project base showed mean velocities ranging from 70-77 percent of V_{inf} for at least one wind direction.

The highest values of effective gust velocity in the PRE configuration (represented by the mean plus 1.5 RMS), presented as a percentage of the mean velocity at 900 feet, were measured at locations 24, 25, 32 and 33. The highest values ranged from 100 to 108 percent of the mean velocity at 900 feet (V_{inf}). With the PH1 or PH2 configurations, several additional points indicated gust velocities above 100 percent for one or more wind directions: locations 26, 38, 40, 41, 46 and 50. These values ranged from 100-112 percent of V_{inf}.

Velocity percentages provide an indication of general levels of pedestrian comfort. However, they do not reflect the frequency with which winds approach from a particular sector; nor do they reflect the probability of approaching high winds occurring within each sector. The result of accounting for these effects is described below.

The quantitative prediction of pedestrian wind environment was made by combining the statistical description of the wind, discussed in Appendix A, with the data of Table 2. The resulting statistical distributions of wind speeds are presented in the figures of Appendix D. These show the percentage of time that mean wind speeds or effective (mean + 1.5 RMS) gust velocities exceed a given level. On the basis of the figures of Appendix D, the position with the highest wind speeds was predicted to be location 32, across the freeway from the project site. This location, at the corner of a building, had high mean wind speeds and effective gust velocities for both the build and no-build cases.

Of interest is the value of mean wind speeds and effective gust velocity exceeded one percent of the time.

Summaries of mean and effective gust velocities exceeded one percent of the time are shown in Tables 1a and 1b. Note that location 48 in the PRE (No-Build) configuration is calculated, not measured. It corresponds to an open site, such as the airport directly across Fort Point Channel from the project site. Tables 1a and 1b show that both the mean wind speeds and effective gust velocities tended to increase or decrease together with addition of PH1 or PH2 to the site.

Several observations are evident from the Table:

- Location 48 in the PRE (No-Build) configuration, representing open terrain, had an effective gust velocity of 30 mph, only 1 mph below the city design guidance criterion. At Location 31, in an open area where some shielding from the mass of the city can be felt, effective gust velocities averaged 28 mph for the three cases, 3 mph below the design guidance criterion. These two locations demonstrate the naturally windy environment in the City of Boston. They also show that small increases in wind velocity may cause exceedences of the informal design guidance criterion.
- Locations where PH1 and PH2 decreased wind speeds included 5, 7, 12, 34.
- Locations where PH1 and PH2 increased wind speeds included 4, 8, 14, 18-21, 29, 36-41, 43-47.
- Locations where gust wind speeds were above 31 mph in the PRE (No-Build) configuration included 2, 24, 25, 32-34. These locations are at corners of existing structures.
- Locations where PH1 or PH2 caused gust velocities to increase above 31 mph at the one percent exceedance level included locations 40, 45 through 47, and 50 for PH1, and 37 and 38 for PH2. These locations are pri-

marily at the base of the International Place project. The maximum wind levels were 37 mph, (location 47) under PH1, and 35 mph (location 38) under the PH2 configuration. Increases above the design guidance criterion were also measured at locations 26 and 29. These are attributed to the proposed Rowes Wharf development which was included in the PH1 and PH2 configurations, but not in the PRE configuration. In addition, the exceedences at location 40 and 45 through 47 will be temporary since these exceedences no longer occur under the PH2 configuration.

- Location 50 in the PH1 configuration had a gust velocity of 33 mph, however, this point cannot be compared directly to the PRE or PH2 configurations as buildings occupy this location under these cases.
- The largest single effective gust velocity attributable to the completed International Place was 35 mph (location 35). Sites in the PRE (preconstruction) configuration whose peak gusts exceeded 35 mph were 2, 24, 25, 32, and 34.

TABLE 1a

MEAN VELOCITIES (mph) EXCEEDED ONE PERCENT OF THE TIME

Location	Configuration			Location	Configuration		
	PRE	PH1	PH2		PRE	PH1	PH2
1	20	19	18	26	22	25	25
2	25	24	23	27	20	23	22
3	16	16	16	28	19	13	18
4	16	16	20	29	20	22	24
5	22	17	19	30	14	14	16
6	16	16	17	31	22	20	22
7	20	16	14	32	34	33	37
8	11	17	16	33	25	22	22
9	14	16	16	34	25	21	21
10	16	14	16	35	12	14	13
11	17	17	17	36	9	21	16
12	20	17	15	37	12	22	26
13	16	16	15	38	13	20	24
14	13	15	16	39	14	17	17
15	17	18	20	40	9	25	21
16	13	10	13	41	14	22	23
17	15	16	15	42	13	14	14
18	12	20	23	43	9	16	17
19	10	17	17	44	12	18	23
20	9	12	19	45	13	22	20
21	12	17	16	46	14	21	21
22	14	13	14	47	14	26	21
23	15	15	15	48	22*	16**	
24	28	29	29	49		17**	
25	27	26	27	50		21**	

* This velocity for PRE configuration only corresponds to a calculated open-country velocity with V/V = 0.45 -- see text.

** Locations which existed only for configuration PH1.

TABLE 1b

GUST (MEAN + 1.5 RMS) VELOCITIES (mph) EXCEEDED ONE PERCENT OF THE TIME

Location	Configuration			Location	Configuration		
	PRE	PH1	PH2		PRE	PH1	PH2
1	30	28	27	26	31	34	35
2	36	35	34	27	29	30	30
3	26	27	26	28	27	21	27
4	25	26	29	29	28	31	34
5	30	24	26	30	22	21	24
6	24	24	24	31	28	27	29
7	28	23	21	32	49	47	53
8	18	26	24	33	33	31	31
9	21	24	24	34	36	32	32
10	24	20	23	35	18	21	20
11	27	24	26	36	14	30	25
12	27	24	22	37	19	31	34
13	24	23	23	38	21	27	35
14	22	23	24	39	22	24	25
15	25	24	27	40	15	34	30
16	21	16	29	41	21	30	31
17	22	22	22	42	20	23	21
18	19	27	30	43	15	24	25
19	15	23	25	44	19	28	31
20	14	18	26	45	21	32	31
21	18	25	23	46	21	33	30
22	22	20	22	47	24	37	30
23	25	25	25	48	30*	25**	
24	37	37	38	49		27**	
25	36	36	38	50		33**	

* This velocity for PRE configuration only corresponds to a calculated open-country velocity with V/V = 0.45, Vrms/V = 0.11 -- see text.

** Locations which existed only for configuration PH1.

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PRE CONSTRUCTION SITE

LOCATION 1

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	55.7	15.8	79.3
22.50	43.0	11.5	60.2
45.00	37.5	9.2	51.4
67.50	32.1	7.7	43.7
90.00	52.9	12.7	71.9
112.50	50.6	14.7	72.8
135.00	17.6	7.2	28.5
157.50	26.4	8.5	39.2
180.00	26.3	5.9	35.1
202.50	22.4	5.9	31.2
225.00	43.9	19.6	73.3
247.50	38.0	18.9	66.3
270.00	31.3	14.5	53.0
292.50	36.0	14.7	58.0
315.00	28.7	12.5	47.5
337.50	39.3	15.0	61.7

LOCATION 2

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	32.9	10.2	48.2
22.50	55.6	12.8	74.8
45.00	36.0	12.7	55.0
67.50	32.9	9.9	47.7
90.00	62.4	16.6	87.3
112.50	70.8	15.5	94.1
135.00	62.5	10.7	78.6
157.50	55.5	9.0	69.1
180.00	50.6	11.9	68.5
202.50	26.9	10.7	43.0
225.00	22.8	11.7	40.3
247.50	42.7	16.8	67.9
270.00	50.9	16.0	74.8
292.50	46.3	17.1	71.9
315.00	43.0	14.5	64.7
337.50	40.6	13.7	61.1

LOCATION 3

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	24.7	10.6	40.5
22.50	29.6	13.5	49.8
45.00	24.3	10.4	39.8
67.50	31.4	12.6	50.4
90.00	40.3	15.6	63.8
112.50	39.1	16.5	63.9
135.00	37.2	12.0	55.2
157.50	28.3	8.9	41.7
180.00	26.3	11.9	44.1
202.50	33.8	13.6	54.2
225.00	38.4	10.4	54.0
247.50	37.2	12.7	56.3
270.00	31.9	14.5	53.5
292.50	30.1	14.2	51.3
315.00	26.8	14.1	47.9
337.50	15.5	8.0	27.5

LOCATION 4

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	15.4	7.3	26.4
22.50	15.5	6.6	25.3
45.00	31.3	8.7	44.4
67.50	35.9	11.5	53.2
90.00	30.1	11.6	47.5
112.50	35.5	13.0	55.0
135.00	24.1	9.4	38.2
157.50	16.4	6.8	26.6
180.00	13.4	4.2	19.7
202.50	29.4	11.5	46.7
225.00	28.4	11.0	44.8
247.50	31.5	12.0	49.5
270.00	32.2	12.4	50.8
292.50	33.4	14.2	54.7
315.00	34.6	15.4	57.6
337.50	18.9	9.2	32.6

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PRE CONSTRUCTION SITE

LOCATION 5

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	18.9	5.6	27.2
22.50	33.1	7.5	44.3
45.00	52.0	14.3	73.5
67.50	51.7	15.7	75.2
90.00	33.0	10.0	48.0
112.50	30.8	9.0	44.3
135.00	40.3	13.2	60.2
157.50	40.4	13.1	60.1
180.00	51.7	16.1	75.9
202.50	59.1	12.3	77.5
225.00	45.1	15.4	68.2
247.50	14.4	8.5	27.2
270.00	15.1	8.3	27.5
292.50	14.3	8.4	27.0
315.00	11.6	6.9	21.9
337.50	15.5	7.4	26.7

LOCATION 6

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	27.0	9.6	41.4
22.50	46.2	9.6	60.6
45.00	37.5	13.4	57.5
67.50	31.4	10.0	46.4
90.00	23.1	8.3	35.4
112.50	22.9	8.8	36.1
135.00	29.6	8.7	42.6
157.50	31.2	8.3	43.6
180.00	24.7	8.2	37.1
202.50	33.0	11.0	49.5
225.00	45.1	12.9	64.6
247.50	40.4	13.4	60.5
270.00	30.3	13.8	50.9
292.50	15.8	7.3	26.8
315.00	12.8	5.8	21.6
337.50	12.2	4.8	19.4

LOCATION 7

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	26.0	10.4	35.6
22.50	35.1	10.6	51.0
45.00	52.9	14.6	74.8
67.50	58.7	13.1	78.4
90.00	44.8	11.9	62.6
112.50	35.5	12.3	54.0
135.00	17.5	6.8	27.7
157.50	18.9	7.7	30.4
180.00	21.1	9.0	34.6
202.50	22.7	10.2	38.0
225.00	22.9	10.6	38.8
247.50	14.2	8.3	26.6
270.00	26.7	10.8	42.9
292.50	29.2	11.0	45.7
315.00	26.5	9.0	40.0
337.50	23.0	7.3	33.9

LOCATION 8

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	16.4	8.2	28.6
22.50	17.5	7.4	28.6
45.00	36.3	14.2	57.6
67.50	23.0	10.1	38.2
90.00	23.0	10.1	38.1
112.50	25.5	9.7	40.0
135.00	28.9	13.4	48.9
157.50	25.4	10.2	40.8
180.00	20.4	8.6	33.3
202.50	21.8	8.9	35.2
225.00	21.5	9.6	35.9
247.50	14.5	6.2	23.8
270.00	17.0	9.0	30.5
292.50	17.2	7.7	28.7
315.00	14.0	6.4	23.6
337.50	12.3	5.4	20.4

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PRE CONSTRUCTION SITE

LOCATION 9

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	23.4	10.5	39.2
22.50	25.7	8.3	38.2
45.00	44.0	14.2	65.3
67.50	24.2	9.3	38.2
90.00	20.4	7.3	31.3
112.50	20.6	9.4	34.7
135.00	21.8	10.7	37.8
157.50	32.1	15.1	54.8
180.00	33.6	13.4	53.7
202.50	28.0	9.0	41.5
225.00	26.1	8.4	38.7
247.50	13.9	7.2	24.8
270.00	17.2	8.3	29.6
292.50	16.1	7.4	27.3
315.00	13.9	6.2	23.3
337.50	14.0	5.6	22.7

LOCATION 10

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	25.6	8.7	38.6
22.50	14.4	5.0	21.9
45.00	19.4	8.7	32.4
67.50	14.5	4.8	21.8
90.00	22.4	10.4	38.1
112.50	34.0	17.2	59.7
135.00	36.2	9.9	51.0
157.50	33.0	9.5	47.4
180.00	35.2	11.0	52.1
202.50	37.4	9.5	51.7
225.00	34.8	11.1	51.5
247.50	14.0	7.1	24.6
270.00	34.9	11.2	51.7
292.50	37.8	10.5	53.6
315.00	33.1	8.7	46.1
337.50	31.1	8.0	43.1

LOCATION 11

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	26.8	11.1	43.4
22.50	37.5	8.9	50.8
45.00	46.7	11.6	64.1
67.50	33.0	13.7	53.6
90.00	39.8	17.1	65.5
112.50	37.5	13.4	57.6
135.00	31.9	11.3	48.8
157.50	33.9	13.1	53.5
180.00	33.2	11.9	51.0
202.50	31.5	11.9	49.3
225.00	17.7	10.2	33.0
247.50	37.3	14.8	59.4
270.00	33.9	14.6	55.8
292.50	28.7	12.7	47.6
315.00	25.0	11.0	41.4
337.50	20.4	8.7	33.4

LOCATION 12

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	22.1	10.6	38.0
22.50	34.6	11.2	51.3
45.00	34.5	9.9	49.4
67.50	50.9	10.8	67.1
90.00	57.0	12.0	75.0
112.50	57.9	11.0	74.4
135.00	40.6	11.3	57.5
157.50	24.3	9.7	38.8
180.00	38.2	12.2	56.5
202.50	33.8	11.3	50.6
225.00	22.0	8.9	35.4
247.50	10.8	4.9	18.2
270.00	19.0	8.5	31.7
292.50	20.0	8.5	32.8
315.00	17.0	7.8	28.7
337.50	14.5	6.5	24.3

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PRE CONSTRUCTION SITE

LOCATION 13

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	41 5	11 1	58 2
22 50	36 5	9 4	50 6
45 00	34 9	12 7	54 0
67 50	23 3	9 0	36 8
90 00	38 3	11 7	55 8
112 50	45 7	10 3	61 2
135 00	47 1	7 7	58 7
157 50	37 7	7 1	48 3
180 00	26 8	9 0	40 3
202 50	19 1	8 4	31 7
225 00	16 0	8 1	28 1
247 50	13 4	6 5	23 1
270 00	21 8	11 2	38 6
292 50	26 6	15 5	49 9
315 00	19 4	12 1	37 6
337 50	36 1	11 7	53 6

LOCATION 14

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	23 6	9 9	38 5
22 50	18 7	7 8	30 3
45 00	20 6	8 4	33 2
67 50	16 1	6 2	25 4
90 00	31 5	11 4	48 5
112 50	29 2	10 7	45 2
135 00	25 9	7 7	37 5
157 50	27 9	7 4	39 0
180 00	25 0	7 6	36 5
202 50	22 1	6 0	31 1
225 00	21 7	7 9	33 6
247 50	10 4	5 4	18 5
270 00	28 4	13 7	48 9
292 50	29 8	12 2	48 1
315 00	28 4	10 7	44 4
337 50	25 1	9 6	39 5

LOCATION 15

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	32 3	9 7	46 8
22 50	32 9	7 4	44 0
45 00	47 1	12 7	66 2
67 50	34 4	12 2	52 7
90 00	28 8	12 6	47 6
112 50	24 4	9 8	39 0
135 00	28 7	11 0	45 2
157 50	47 1	8 4	59 7
180 00	44 8	8 3	57 2
202 50	39 3	7 9	51 1
225 00	26 4	8 6	39 2
247 50	21 3	10 7	37 3
270 00	27 6	11 3	44 5
292 50	29 2	10 4	44 8
315 00	27 3	9 3	41 3
337 50	27 4	8 3	39 8

LOCATION 16

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	27 3	7 9	39 2
22 50	20 6	5 0	28 2
45 00	25 8	8 2	38 1
67 50	24 3	8 6	37 2
90 00	32 3	12 8	51 4
112 50	33 2	11 9	51 0
135 00	43 8	8 4	56 5
157 50	25 9	7 6	37 2
180 00	17 9	6 5	27 6
202 50	15 5	8 1	23 2
225 00	36 9	12 6	55 7
247 50	29 4	12 8	48 6
270 00	18 7	10 3	34 1
292 50	19 7	9 3	33 6
315 00	24 5	9 8	39 2
337 50	21.9	8 2	34 2

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PRE CONSTRUCTION SITE

LOCATION 17

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	23.6	8.5	36.3
22.50	25.8	7.9	37.7
45.00	24.4	9.0	37.9
67.50	22.9	8.0	34.9
90.00	38.2	9.8	52.8
112.50	30.4	10.6	46.3
135.00	36.1	9.3	50.0
157.50	25.6	10.5	41.4
180.00	27.0	11.5	44.2
202.50	28.8	11.2	45.7
225.00	10.1	4.6	17.0
247.50	19.6	8.0	31.6
270.00	31.8	9.6	46.2
292.50	35.7	10.2	51.0
315.00	28.1	9.9	43.0
337.50	24.0	8.9	37.4

LOCATION 18

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	20.6	9.9	35.4
22.50	27.7	9.8	42.3
45.00	31.7	10.9	48.1
67.50	26.4	9.1	40.0
90.00	25.2	8.5	38.0
112.50	22.9	6.8	33.2
135.00	31.5	11.8	49.2
157.50	35.7	12.6	54.6
180.00	36.7	13.3	56.6
202.50	23.3	10.3	38.7
225.00	14.9	7.1	25.4
247.50	14.8	5.6	23.2
270.00	15.5	6.2	24.8
292.50	13.0	4.4	19.5
315.00	15.1	5.9	23.9
337.50	17.1	7.2	27.9

LOCATION 19

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	19.0	8.5	31.8
22.50	22.1	7.4	33.2
45.00	23.4	7.8	35.2
67.50	15.5	6.6	25.3
90.00	17.1	6.3	26.5
112.50	26.7	8.6	39.6
135.00	33.0	9.5	47.2
157.50	30.6	10.7	46.7
180.00	30.9	11.2	47.7
202.50	21.6	7.5	32.9
225.00	20.0	7.2	30.8
247.50	14.9	5.8	23.6
270.00	11.9	4.5	18.6
292.50	10.9	3.8	16.6
315.00	9.5	3.9	15.3
337.50	11.1	5.1	18.8

LOCATION 20

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	12.5	6.8	22.6
22.50	14.7	4.7	21.8
45.00	24.0	8.1	36.1
67.50	16.7	6.7	26.8
90.00	17.6	6.1	26.9
112.50	22.1	7.0	32.6
135.00	24.8	7.9	36.7
157.50	30.2	8.7	43.2
180.00	26.1	9.8	40.9
202.50	19.5	6.7	29.6
225.00	16.0	7.9	27.8
247.50	14.0	5.9	22.8
270.00	10.8	5.2	18.6
292.50	10.5	5.1	18.2
315.00	10.0	4.2	16.3
337.50	9.2	3.9	15.1

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE FPE CONSTRUCTION SITE

LOCATION 21

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	18.7	8.2	31.0
22.50	39.7	16.8	64.9
45.00	24.2	8.7	37.2
67.50	21.2	7.8	32.9
90.00	26.1	9.8	40.9
112.50	25.4	11.0	41.9
135.00	26.1	10.7	42.2
157.50	26.3	8.3	38.8
180.00	30.5	8.5	43.2
202.50	27.4	9.4	41.5
225.00	16.0	6.8	26.2
247.50	12.5	4.6	19.4
270.00	14.5	5.3	22.5
292.50	15.0	5.4	23.2
315.00	14.8	5.4	22.9
337.50	14.3	5.5	22.5

LOCATION 22

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	17.7	6.6	27.6
22.50	24.2	8.2	36.5
45.00	34.9	14.3	56.3
67.50	19.9	7.7	31.4
90.00	37.9	10.4	53.5
112.50	43.2	14.5	65.0
135.00	24.7	9.8	39.3
157.50	23.1	8.1	35.3
180.00	16.4	5.5	24.6
202.50	13.1	4.2	19.4
225.00	9.2	3.2	14.1
247.50	21.3	9.5	35.6
270.00	12.4	5.5	20.6
292.50	12.2	4.6	19.2
315.00	16.9	5.5	25.2
337.50	19.0	7.1	29.6

LOCATION 23

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	22.1	10.6	38.0
22.50	35.2	15.0	57.7
45.00	35.2	12.8	54.4
67.50	24.8	11.1	41.5
90.00	39.0	17.2	64.8
112.50	41.8	18.6	69.7
135.00	35.2	15.5	58.4
157.50	44.9	20.1	75.0
180.00	33.4	11.9	51.3
202.50	33.8	10.5	49.5
225.00	21.8	9.1	35.5
247.50	15.6	6.8	25.8
270.00	25.2	12.3	43.6
292.50	16.4	8.4	29.0
315.00	26.8	12.6	45.7
337.50	21.6	10.5	37.3

LOCATION 24

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	43.3	19.3	72.3
22.50	43.8	18.8	72.0
45.00	66.7	15.6	90.1
67.50	52.4	16.2	76.7
90.00	69.9	15.1	92.6
112.50	84.6	10.7	100.7
135.00	86.4	11.4	103.5
157.50	64.2	26.1	103.4
180.00	35.9	16.1	60.1
202.50	33.6	15.0	56.1
225.00	39.1	15.7	62.5
247.50	23.7	12.0	41.7
270.00	32.2	9.9	47.2
292.50	43.0	11.4	60.1
315.00	48.9	17.9	75.6
337.50	46.6	22.9	81.0

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PPE CONSTRUCTION SITE

LOCATION 25

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	33.8	14.4	55.4
22.50	54.0	18.5	81.7
45.00	50.7	18.9	79.0
67.50	62.8	18.7	90.9
90.00	82.3	12.5	100.9
112.50	62.7	15.3	85.6
135.00	27.0	10.8	43.1
157.50	27.2	10.5	42.9
180.00	32.8	12.3	51.3
202.50	63.1	13.9	83.9
225.00	44.4	9.7	59.0
247.50	30.4	9.3	44.3
270.00	14.6	7.3	25.5
292.50	39.8	14.3	52.2
315.00	33.2	16.6	58.0
337.50	37.1	18.0	64.1

LOCATION 26

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	31.2	11.9	49.1
22.50	41.5	17.0	67.0
45.00	25.5	10.3	40.9
67.50	46.2	17.5	72.5
90.00	57.7	10.4	73.4
112.50	59.9	8.4	72.5
135.00	50.9	7.8	62.6
157.50	40.6	11.1	57.2
180.00	23.9	9.5	38.1
202.50	25.1	10.5	41.0
225.00	16.4	8.3	28.9
247.50	18.8	9.5	33.0
270.00	30.8	10.9	47.1
292.50	44.7	13.7	65.4
315.00	46.9	12.5	65.6
337.50	38.0	13.7	58.6

LOCATION 27

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	29.4	10.3	44.8
22.50	27.1	10.9	43.5
45.00	55.5	14.2	76.9
67.50	46.3	9.6	60.6
90.00	47.2	9.4	61.3
112.50	48.8	9.5	63.0
135.00	40.6	9.8	55.3
157.50	26.0	11.2	42.8
180.00	23.4	10.2	38.7
202.50	31.8	13.3	51.7
225.00	30.9	12.1	49.1
247.50	33.2	16.3	57.6
270.00	19.6	10.5	35.4
292.50	39.4	12.7	58.4
315.00	38.0	11.8	55.7
337.50	32.4	10.6	48.3

LOCATION 28

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	29.2	10.5	45.0
22.50	21.7	8.7	34.8
45.00	51.3	16.6	76.1
67.50	45.2	10.5	60.9
90.00	46.8	9.9	61.6
112.50	41.6	10.7	57.6
135.00	35.0	13.0	54.5
157.50	21.5	8.0	33.5
180.00	23.1	9.1	36.8
202.50	28.7	11.6	46.2
225.00	33.6	14.2	55.0
247.50	34.0	15.7	57.5
270.00	22.5	12.3	40.9
292.50	29.8	12.4	48.5
315.00	25.5	10.8	41.7
337.50	30.0	10.1	45.2

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PRE CONSTRUCTION SITE

LOCATION 29

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	27.8	10.0	42.9
22.50	28.8	10.0	43.8
45.00	53.4	12.9	72.7
67.50	51.8	9.9	66.7
90.00	49.1	9.0	62.5
112.50	36.7	13.0	56.1
135.00	20.5	6.9	31.0
157.50	25.5	8.6	38.4
180.00	25.7	8.6	38.6
202.50	34.0	11.1	50.7
225.00	39.4	13.1	59.0
247.50	37.7	15.5	60.9
270.00	35.2	12.4	53.8
292.50	20.3	9.8	35.1
315.00	21.0	9.5	35.2
337.50	29.5	11.0	46.0

LOCATION 30

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	39.0	13.0	58.5
22.50	34.6	11.3	51.5
45.00	29.2	11.8	47.0
67.50	28.6	10.9	45.0
90.00	35.3	10.1	50.4
112.50	21.1	9.1	34.8
135.00	41.7	11.7	59.2
157.50	41.5	13.4	61.5
180.00	37.3	13.5	57.5
202.50	23.7	8.4	36.2
225.00	17.4	7.3	28.3
247.50	18.2	8.0	30.3
270.00	18.4	8.9	31.7
292.50	13.9	5.6	22.2
315.00	28.8	10.4	44.4
337.50	35.8	12.4	54.4

LOCATION 31

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	39.0	9.0	52.5
22.50	59.6	9.8	74.3
45.00	57.0	10.3	72.5
67.50	54.7	10.1	69.9
90.00	43.9	10.8	60.0
112.50	33.9	9.3	47.9
135.00	29.2	8.9	42.5
157.50	37.8	9.3	51.7
180.00	44.2	10.3	59.7
202.50	48.4	10.5	64.1
225.00	39.6	10.6	55.5
247.50	31.6	12.6	50.5
270.00	21.3	8.8	34.5
292.50	12.4	6.0	21.4
315.00	24.2	9.7	38.8
337.50	33.0	10.4	48.6

LOCATION 32

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	56.1	24.6	93.1
22.50	59.8	22.4	93.4
45.00	37.7	18.7	65.7
67.50	52.6	16.3	77.1
90.00	63.7	14.6	85.6
112.50	56.9	13.6	77.3
135.00	30.9	12.0	48.9
157.50	36.0	13.3	55.9
180.00	40.6	12.5	59.4
202.50	38.2	13.3	58.1
225.00	79.1	17.4	105.2
247.50	79.2	19.4	108.3
270.00	75.6	20.1	105.9
292.50	79.5	18.4	107.0
315.00	74.1	19.0	102.6
337.50	50.4	24.2	86.9

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PRE CONSTRUCTION SITE

LOCATION 33

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	43.2	8.9	56.6
22.50	80.2	13.4	100.3
45.00	70.6	11.1	87.3
67.50	41.5	11.9	59.4
90.00	37.6	12.3	56.1
112.50	29.4	10.7	45.5
135.00	17.9	6.1	27.0
157.50	38.8	11.0	55.4
180.00	54.2	10.2	69.5
202.50	51.3	13.3	71.2
225.00	44.3	14.2	65.5
247.50	33.7	13.9	54.6
270.00	43.4	16.5	68.0
292.50	24.1	10.2	39.4
315.00	17.1	6.7	27.2
337.50	33.7	8.0	45.7

LOCATION 34

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	30.5	9.1	44.2
22.50	52.6	16.7	77.6
45.00	49.3	18.7	77.3
67.50	53.5	15.0	76.0
90.00	64.4	16.3	88.8
112.50	26.3	10.0	41.4
135.00	23.8	8.7	36.9
157.50	29.5	11.4	46.5
180.00	55.3	15.1	77.9
202.50	61.0	15.2	83.8
225.00	58.5	17.9	85.3
247.50	48.5	18.6	76.4
270.00	46.7	16.6	71.6
292.50	36.2	13.1	55.9
315.00	14.9	7.2	25.7
337.50	25.5	8.9	38.7

LOCATION 35

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	14.5	4.9	21.8
22.50	25.7	7.7	37.3
45.00	26.3	8.0	38.3
67.50	23.2	6.5	32.9
90.00	27.6	7.9	39.5
112.50	30.6	9.8	45.3
135.00	22.1	7.9	33.9
157.50	24.7	9.4	38.8
180.00	26.0	9.7	40.6
202.50	30.7	11.9	48.5
225.00	26.5	11.5	43.8
247.50	17.2	8.0	29.2
270.00	12.6	5.8	21.3
292.50	10.2	4.5	17.0
315.00	8.6	2.9	12.9
337.50	11.2	4.2	17.4

LOCATION 36

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	9.7	3.3	15.6
22.50	19.9	6.5	29.6
45.00	19.8	6.7	29.9
67.50	22.5	7.9	34.4
90.00	19.1	6.0	28.1
112.50	23.6	10.8	39.8
135.00	17.1	5.4	25.3
157.50	17.1	5.3	25.1
180.00	19.1	6.7	29.1
202.50	20.6	8.4	33.2
225.00	8.5	4.1	14.7
247.50	5.8	2.4	9.4
270.00	6.3	2.3	9.7
292.50	5.5	1.9	8.4
315.00	5.4	2.0	8.5
337.50	8.7	3.5	13.9

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PRE CONSTRUCTION SITE

LOCATION 37

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	5.8	2.0	8.9
22.50	20.0	6.7	30.0
45.00	23.8	8.7	36.8
67.50	17.4	5.9	26.2
90.00	17.3	5.0	24.8
112.50	18.8	5.8	27.5
135.00	17.4	6.2	26.7
157.50	19.3	8.3	31.7
180.00	31.3	14.1	52.5
202.50	36.6	13.0	56.0
225.00	12.8	8.0	24.9
247.50	9.2	4.5	16.0
270.00	6.7	3.2	11.5
292.50	5.8	2.4	9.3
315.00	5.9	2.5	9.7
337.50	5.2	1.9	7.9

LOCATION 38

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	11.7	6.2	21.1
22.50	27.6	10.6	43.4
45.00	34.9	13.1	54.5
67.50	27.6	9.8	42.4
90.00	20.3	7.5	31.6
112.50	18.9	6.7	28.9
135.00	21.0	7.6	32.4
157.50	19.9	7.4	31.1
180.00	24.0	10.0	39.0
202.50	36.2	16.3	60.6
225.00	10.6	4.9	17.9
247.50	10.1	4.9	17.4
270.00	7.4	3.1	12.0
292.50	6.7	3.0	11.2
315.00	6.8	2.7	10.9
337.50	8.7	4.1	14.8

LOCATION 39

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	10.7	5.7	19.2
22.50	22.8	8.2	35.1
45.00	27.9	10.7	43.9
67.50	33.4	12.8	52.6
90.00	39.2	11.8	56.9
112.50	34.1	11.2	50.8
135.00	42.0	12.5	60.7
157.50	40.8	11.9	58.7
180.00	43.1	13.2	63.0
202.50	25.9	10.1	41.1
225.00	12.8	6.2	22.1
247.50	9.4	4.4	16.1
270.00	15.1	9.5	29.4
292.50	11.8	7.3	22.7
315.00	13.5	8.0	25.4
337.50	12.1	5.9	20.9

LOCATION 40

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	8.6	4.1	14.7
22.50	17.8	6.9	28.1
45.00	22.9	9.3	36.9
67.50	18.4	5.8	27.1
90.00	17.3	5.0	24.8
112.50	17.8	6.1	26.9
135.00	25.2	11.6	42.5
157.50	31.6	12.9	51.0
180.00	27.3	13.2	47.1
202.50	19.3	5.9	28.1
225.00	13.2	5.1	20.9
247.50	8.1	3.4	13.3
270.00	13.7	6.2	23.1
292.50	12.3	5.4	20.5
315.00	11.8	5.4	19.9
337.50	10.8	5.4	18.9

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PRE CONSTRUCTION SITE

LOCATION 41

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0 00	26 4	8 9	39 7
22 50	30 9	7 4	41 9
45 00	45 4	12 2	63 7
67 50	30 5	7 5	41 8
90 00	24 8	7 2	35 6
112 50	20 4	6 1	29 6
135 00	20 7	9 2	34 6
157 50	26.2	11.9	44 0
180 00	28 1	12.3	46 6
202 50	24 6	8 8	37 8
225 00	17 3	7 8	29 1
247 50	11 3	5 0	18 7
270 00	18 4	10 6	34 3
292 50	19 2	9 4	33 3
315 00	12 7	6 4	22 3
337 50	19 5	7 8	31 2

LOCATION 42

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	27 8	10 0	42 8
22 50	23 6	8 1	35 8
45.00	27 9	11 7	45 4
67 50	29 5	12 1	47 7
90 00	29 8	10 1	45 0
112 50	38 4	11 5	55 7
135 00	25 3	10 2	40 6
157 50	22 5	9 5	36 7
180 00	20 2	8 6	33 2
202 50	15 8	5 9	24 6
225 00	13 8	5 8	22 5
247 50	10 3	4 4	16 8
270 00	10 6	4 4	17 2
292 50	10 4	4 1	16 6
315 00	10 2	4 0	16 2
337 50	17 0	8 5	29 6

LOCATION 43

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0 00	19 6	8 5	32 4
22 50	15 3	5 7	23 8
45 00	26 9	11 1	43 5
67 50	20.3	8 5	33 1
90 00	21 1	7 3	32 0
112 50	22 1	6 7	32 2
135 00	20 8	8 6	33 7
157 50	21 2	9 4	35 3
180 00	21 4	10 0	36 3
202 50	18 6	8 3	31.0
225 00	13 9	6 5	23 6
247 50	10 9	4 9	18 3
270 00	11 1	5 4	19 2
292.50	10.8	4.2	17 2
315 00	10 9	4 1	17 0
337 50	11 2	4 4	17.8

LOCATION 44

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	15 9	7 3	26 9
22 50	28.1	9 3	42 1
45 00	26 9	10 7	42 9
67 50	20 4	7 2	31 2
90 00	24 2	7 3	35 2
112 50	29 1	6 9	39 5
135 00	27 0	9 7	41 5
157 50	33 5	10 6	49 4
180 00	34 2	12 3	52 6
202.50	30.8	12 8	50 1
225.00	13 7	6 4	23.2
247 50	15 0	7 1	25 7
270 00	11 1	4 1	17 3
292 50	12 5	5 9	21 3
315 00	12 8	6 1	22 0
337 50	11 5	4 7	18 5

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PRE CONSTRUCTION SITE

LOCATION 45

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0 00	26 1	10 2	41 4
22 50	40 9	12 7	60 0
45 00	30 1	12 9	49 4
67 50	23 8	8 2	36 1
90 00	20 5	6 8	30 7
112 50	19 6	6 1	28 7
135 00	22 4	9 7	36 9
157 50	35 2	11 7	52 8
180 00	34 3	11 1	51 0
202 50	35 1	13 5	55 4
225 00	15 7	7 8	27 4
247 50	17 2	8 9	30 5
270 00	9 7	4 1	15 8
292 50	12 3	5 5	20 6
315 00	15 7	6 6	25 5
337 50	16 8	7 7	28 3

LOCATION 46

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	14 4	6 4	23 9
22 50	38 2	15 7	61 7
45 00	27 7	10 0	42 7
67 50	29 3	8 1	41 4
90 00	26 9	8 1	39 1
112 50	21 3	7 5	32 5
135 00	23 3	9 8	38 0
157 50	33 0	11 4	50 1
180 00	30 4	12 7	49 4
202 50	39 7	12 1	57 8
225 00	14 8	7 2	25 6
247 50	22 0	10 5	37 7
270 00	13 7	6 2	23 0
292 50	11 3	4 9	18 7
315 00	13 0	6 9	23 4
337 50	17.1	7 5	28 3

LOCATION 47

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	12 3	4 8	19 4
22 50	44 5	16 1	68 6
45 00	28 2	11 5	45 5
67 50	26 3	9 9	41 1
90 00	24 4	9 2	38 1
112 50	31 4	9 3	45 3
135 00	33 3	10 8	49 5
157 50	33 3	10 6	49 1
180 00	34 5	10 4	50 1
202 50	23 8	10 0	38 9
225 00	27 3	14 0	48 3
247 50	27 4	14 8	49 6
270 00	26 7	12.9	46.0
292 50	30 8	14 6	52 7
315 00	24 6	11 5	41 8
337 50	13 4	5 3	21 3

LOCATION 48

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	45 0	11 0	61 5
22 50	45 0	11 0	61 5
45 00	45 0	11 0	61 5
67 50	45 0	11 0	61 5
90 00	45 0	11 0	61 5
112 50	45.0	11 0	61 5
135 00	45 0	11 0	61 5
157.50	45 0	11 0	61 5
180 00	45 0	11 0	61 5
202 50	45 0	11 0	61 5
225 00	45 0	11 0	61 5
247 50	45 0	11 0	61 5
270.00	45 0	11 0	61 5
292 50	45 0	11 0	61 5
315.00	45 0	11 0	61 5
337 50	45 0	11 0	61 5

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE I WITH EXISTING OFF-RAMP

LOCATION 1

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	34.0	10.8	50.1
22.50	45.5	8.9	58.8
45.00	41.3	9.6	55.7
67.50	35.7	7.7	47.2
90.00	41.6	9.5	55.8
112.50	52.0	14.3	73.5
135.00	15.9	5.8	24.7
157.50	28.5	7.6	39.8
180.00	28.7	6.6	38.7
202.50	23.5	6.2	32.7
225.00	38.9	17.6	65.2
247.50	37.9	18.4	65.6
270.00	33.7	16.7	58.8
292.50	36.2	15.1	58.9
315.00	31.5	14.4	53.1
337.50	40.1	14.7	62.1

LOCATION 2

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	32.6	9.3	46.5
22.50	55.1	12.4	73.7
45.00	34.0	11.7	51.6
67.50	29.1	7.5	40.3
90.00	48.3	12.3	66.7
112.50	64.5	16.2	88.7
135.00	62.1	9.6	76.5
157.50	53.4	8.4	66.0
180.00	41.9	8.7	55.0
202.50	22.4	8.5	35.1
225.00	21.1	11.4	38.2
247.50	46.1	16.4	70.8
270.00	54.2	16.7	79.3
292.50	47.0	16.7	72.1
315.00	46.2	14.2	67.4
337.50	41.3	14.6	63.2

LOCATION 3

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	22.2	10.9	38.6
22.50	29.2	12.5	48.0
45.00	26.6	11.1	43.3
67.50	22.6	9.9	37.5
90.00	32.6	13.8	53.3
112.50	42.5	15.5	65.7
135.00	34.2	10.9	50.5
157.50	29.7	9.2	43.5
180.00	20.6	8.5	33.4
202.50	32.5	13.4	52.6
225.00	31.3	9.7	45.8
247.50	33.1	12.1	51.2
270.00	37.3	17.0	62.8
292.50	32.2	14.0	53.3
315.00	32.3	15.6	55.6
337.50	16.1	7.9	27.8

LOCATION 4

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	16.2	8.3	28.7
22.50	11.7	4.4	18.3
45.00	29.5	8.9	42.8
67.50	29.3	10.1	44.5
90.00	25.8	10.5	41.5
112.50	33.8	12.4	52.5
135.00	29.0	10.9	45.3
157.50	19.8	8.1	32.0
180.00	13.2	4.2	19.5
202.50	26.5	11.0	43.0
225.00	25.0	10.5	40.7
247.50	28.2	11.8	45.6
270.00	30.4	13.4	50.5
292.50	37.6	15.3	61.4
315.00	36.7	16.2	60.9
337.50	20.1	10.3	35.6

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE I WITH EXISTING OFF-RAMP

LOCATION 5

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	17.2	6.3	26.6
22.50	34.9	7.5	46.2
45.00	42.4	12.0	60.4
67.50	30.8	10.6	46.7
90.00	33.2	10.3	48.6
112.50	34.8	10.6	50.7
135.00	36.0	10.3	51.5
157.50	39.4	11.1	56.1
180.00	46.0	12.1	64.2
202.50	46.1	9.9	60.9
225.00	37.0	17.3	62.9
247.50	16.2	9.7	30.8
270.00	14.7	8.8	27.9
292.50	13.8	8.1	25.9
315.00	11.4	6.4	21.0
337.50	16.5	7.3	27.5

LOCATION 6

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	30.1	9.6	44.5
22.50	41.8	8.9	55.1
45.00	40.1	14.2	61.5
67.50	28.9	10.4	44.4
90.00	33.1	11.1	49.8
112.50	34.6	11.4	51.7
135.00	32.3	9.8	46.9
157.50	39.1	9.3	53.1
180.00	27.5	9.0	41.1
202.50	29.6	11.2	46.4
225.00	41.0	13.3	60.9
247.50	35.3	12.5	54.1
270.00	27.1	14.3	48.6
292.50	14.1	7.6	25.5
315.00	13.5	6.2	22.8
337.50	13.0	5.4	21.1

LOCATION 7

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	22.1	10.7	38.2
22.50	32.9	11.8	50.5
45.00	46.5	17.1	72.1
67.50	40.0	10.7	56.0
90.00	23.2	9.1	36.9
112.50	25.1	11.3	42.0
135.00	20.5	8.8	33.7
157.50	19.1	8.2	31.5
180.00	22.6	9.6	37.0
202.50	23.0	10.0	38.0
225.00	16.1	8.2	28.4
247.50	11.3	6.3	20.8
270.00	23.5	10.8	39.7
292.50	26.5	9.8	41.2
315.00	26.1	9.3	40.1
337.50	13.5	6.7	23.6

LOCATION 8

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	27.6	13.5	47.8
22.50	51.0	17.2	76.8
45.00	42.8	15.7	66.3
67.50	44.0	12.3	62.5
90.00	26.2	8.4	38.8
112.50	30.0	11.7	47.5
135.00	34.1	12.4	52.8
157.50	28.8	11.2	45.6
180.00	28.8	11.8	46.5
202.50	35.0	15.8	58.7
225.00	35.0	15.8	58.6
247.50	36.9	13.7	57.4
270.00	11.5	6.8	21.7
292.50	11.6	6.6	21.6
315.00	15.4	7.6	26.8
337.50	22.0	10.3	37.5

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE I WITH EXISTING OFF-RAMP

LOCATION 9

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	29.7	10.2	45.0
22.50	38.2	13.8	58.8
45.00	44.7	14.7	66.7
67.50	42.8	11.0	59.2
90.00	23.7	8.0	35.7
112.50	28.2	11.5	45.5
135.00	32.5	14.4	54.1
157.50	43.8	16.5	68.6
180.00	40.5	16.0	64.5
202.50	27.5	10.2	42.8
225.00	16.4	8.7	29.4
247.50	23.1	11.8	40.8
270.00	15.7	8.5	28.5
292.50	13.6	6.9	23.3
315.00	13.0	6.5	22.8
337.50	26.0	8.0	37.9

LOCATION 10

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	13.5	7.2	24.3
22.50	12.8	5.0	20.3
45.00	13.8	5.7	22.3
67.50	14.3	5.9	23.1
90.00	19.8	8.3	32.3
112.50	30.6	11.4	47.6
135.00	39.5	11.1	56.2
157.50	37.7	10.9	54.1
180.00	38.5	11.2	55.3
202.50	37.3	9.8	52.0
225.00	27.7	9.1	41.4
247.50	12.6	7.0	23.1
270.00	26.1	9.4	40.2
292.50	28.9	8.9	42.3
315.00	25.8	7.7	37.4
337.50	16.6	7.6	28.0

LOCATION 11

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	29.9	12.8	49.0
22.50	35.3	8.8	48.5
45.00	44.1	10.3	59.6
67.50	32.1	12.6	51.0
90.00	44.8	11.9	62.7
112.50	37.1	11.2	53.9
135.00	35.0	10.8	51.2
157.50	51.1	12.6	70.0
180.00	26.7	11.3	43.7
202.50	22.5	9.8	37.1
225.00	14.6	8.6	27.5
247.50	26.3	12.3	44.7
270.00	26.8	12.7	45.9
292.50	21.5	10.7	37.6
315.00	18.3	9.0	31.8
337.50	17.0	7.6	28.5

LOCATION 12

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	20.4	9.6	34.8
22.50	28.0	9.2	41.7
45.00	31.1	8.9	44.3
67.50	40.0	10.6	55.8
90.00	43.0	10.8	59.3
112.50	45.5	12.0	63.5
135.00	38.8	14.6	60.7
157.50	32.6	13.6	52.9
180.00	42.9	13.4	63.0
202.50	38.8	12.2	57.1
225.00	19.9	12.6	38.8
247.50	7.5	3.8	13.3
270.00	15.5	7.5	26.7
292.50	16.3	7.6	27.7
315.00	24.9	11.8	42.6
337.50	12.8	7.3	23.7

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE I WITH EXISTING OFF-RAMP

LOCATION 13

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	33.5	9.5	47.8
22.50	37.8	9.2	51.7
45.00	37.1	12.8	56.3
67.50	24.6	9.1	38.2
90.00	23.4	8.4	35.9
112.50	47.8	14.6	69.7
135.00	40.6	9.5	54.8
157.50	38.7	10.1	53.9
180.00	30.5	11.7	48.1
202.50	19.9	7.8	31.7
225.00	10.9	5.6	19.3
247.50	11.7	5.4	19.8
270.00	18.5	9.6	33.0
292.50	19.7	12.2	38.0
315.00	15.3	10.4	31.0
337.50	29.4	8.9	42.8

LOCATION 14

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	14.5	8.3	27.0
22.50	14.6	4.9	21.9
45.00	21.1	9.3	35.0
67.50	19.2	7.6	30.6
90.00	16.5	6.4	26.1
112.50	30.5	14.7	52.6
135.00	31.8	11.8	49.5
157.50	47.0	15.1	69.6
180.00	45.6	15.8	69.3
202.50	44.6	14.1	65.8
225.00	20.8	7.6	32.2
247.50	10.2	5.5	18.5
270.00	21.5	11.3	38.4
292.50	20.7	10.4	36.4
315.00	15.2	8.7	28.2
337.50	10.5	6.0	19.4

LOCATION 15

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	26.0	8.3	38.5
22.50	36.8	8.5	49.3
45.00	45.0	11.8	62.7
67.50	34.2	12.6	53.2
90.00	16.6	5.9	25.5
112.50	23.7	9.7	38.3
135.00	22.3	8.1	34.5
157.50	57.8	13.8	78.6
180.00	59.0	10.8	75.2
202.50	43.3	9.0	56.7
225.00	31.6	8.7	44.7
247.50	13.9	6.8	24.0
270.00	21.1	10.1	36.3
292.50	22.2	8.6	35.0
315.00	18.4	8.0	30.4
337.50	21.3	6.9	31.7

LOCATION 16

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	20.1	6.9	30.4
22.50	26.2	5.3	34.2
45.00	29.5	8.1	41.6
67.50	16.0	6.2	25.3
90.00	18.6	5.5	26.9
112.50	20.6	6.6	30.5
135.00	30.6	10.3	46.0
157.50	21.9	7.8	33.6
180.00	18.5	7.4	29.6
202.50	14.9	5.4	23.0
225.00	21.7	12.9	41.0
247.50	21.7	9.5	36.0
270.00	14.0	8.6	27.0
292.50	14.3	7.6	25.7
315.00	19.2	8.5	32.0
337.50	15.0	6.5	24.7

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE I WITH EXISTING OFF-RAMP

LOCATION 17

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	17.1	9.0	30.5
22.50	15.0	6.1	24.1
45.00	23.3	8.0	35.2
67.50	23.2	7.5	34.4
90.00	23.2	7.3	34.1
112.50	53.0	12.1	71.2
135.00	46.8	16.4	71.3
157.50	20.8	8.2	33.1
180.00	31.3	13.8	52.0
202.50	20.1	7.5	31.4
225.00	10.4	4.5	17.2
247.50	10.2	4.7	17.2
270.00	24.2	8.3	36.7
292.50	28.1	8.4	40.7
315.00	17.3	8.2	29.7
337.50	13.7	6.7	23.7

LOCATION 18

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	22.2	11.4	39.4
22.50	21.0	9.3	34.9
45.00	34.7	11.2	51.5
67.50	21.5	7.9	33.3
90.00	16.1	6.5	25.9
112.50	25.9	10.2	41.2
135.00	34.6	15.2	57.4
157.50	56.3	22.2	89.6
180.00	65.1	14.1	86.3
202.50	55.3	12.2	73.6
225.00	46.6	10.2	61.9
247.50	29.3	11.3	46.2
270.00	8.6	5.9	17.4
292.50	6.2	3.5	11.5
315.00	7.4	4.3	13.8
337.50	14.6	8.5	27.4

LOCATION 19

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	9.6	5.0	17.1
22.50	20.2	7.9	32.1
45.00	20.6	8.5	33.3
67.50	14.6	5.2	22.4
90.00	14.6	5.8	23.3
112.50	24.1	9.9	39.0
135.00	67.0	17.5	93.2
157.50	39.7	14.9	62.0
180.00	51.0	14.3	72.4
202.50	42.3	11.8	60.0
225.00	23.1	11.1	39.7
247.50	11.9	7.1	22.6
270.00	6.9	4.1	13.1
292.50	6.0	2.8	10.2
315.00	7.8	3.6	13.2
337.50	11.6	5.6	20.0

LOCATION 20

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	15.9	6.2	25.2
22.50	16.7	6.1	25.8
45.00	20.3	8.1	32.5
67.50	13.0	4.0	19.0
90.00	12.3	3.9	18.1
112.50	18.9	7.8	30.5
135.00	42.2	10.1	57.3
157.50	51.7	12.1	69.9
180.00	37.0	16.5	61.7
202.50	19.5	7.0	30.0
225.00	29.5	11.4	46.7
247.50	15.0	7.1	25.6
270.00	11.0	4.0	17.0
292.50	12.3	4.5	19.1
315.00	12.5	4.5	19.3
337.50	17.7	6.6	27.6

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE 1 WITH EXISTING OFF-RAMP

LOCATION 21

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0 00	15 8	6 2	25 2
22 50	54 0	18 4	81 6
45 00	49 4	16 8	74 6
67 50	19 8	6 8	30 0
90 00	27 7	8 3	40 2
112 50	25 8	10 3	41 2
135 00	43 6	15 6	67 0
157 50	47 6	14 6	69 6
180 00	39 6	12 4	58 1
202 50	17 4	6 8	27 6
225 00	12 3	3 8	18 0
247 50	10 6	3 2	15 4
270 00	13 0	4 9	20 2
292 50	18 1	6 4	27 8
315 00	15 1	6 0	24 1
337 50	16 4	6 2	25 7

LOCATION 22

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	13 9	5 3	21 9
22 50	23 8	9 0	37 3
45 00	38 1	14 8	60 2
67 50	21 9	8 5	34 9
90 00	33 5	10 6	49 5
112 50	35 1	9 2	48 8
135 00	18 9	7 2	29 6
157 50	25 5	9 9	40 4
180 00	19 5	7 8	31 3
202 50	13 7	4 5	20 4
225 00	12 7	4 6	19 6
247 50	16 7	7 1	27 4
270 00	15 4	7 0	25 9
292 50	11 5	4 1	17 6
315 00	13 6	4 7	20 7
337 50	14 9	5 3	22 8

LOCATION 23

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	21 0	8 5	33 8
22 50	37 1	15 3	60 0
45 00	30 2	11 7	47 8
67 50	30 1	13 3	50 0
90 00	41 9	17 6	68 4
112 50	39 7	17 8	66 5
135 00	31 8	14 0	52 9
157 50	22 9	10 1	38 1
180 00	25 0	9 4	39 2
202 50	28 6	9 3	42 6
225 00	21 1	8 3	33 6
247 50	19 9	7 2	30 7
270 00	27 4	12 1	45 5
292 50	18 8	7 9	30 7
315 00	27 2	12 1	45 3
337 50	25 4	10.8	41 7

LOCATION 24

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1 5*URMS/UINF (PERCENT)
0 00	42 5	17 1	68 1
22 50	40 1	17 8	66 8
45 00	58 8	17 4	84 9
67 50	53 8	15 4	77 0
90 00	74 6	13 8	95 3
112 50	87 2	11 6	104 6
135 00	80 4	12 5	99 2
157 50	64 3	15 0	86 8
180 00	36 6	17 5	62 8
202 50	27 7	11 9	45 6
225 00	30 7	12 9	50 1
247 50	26 8	11 3	43 7
270 00	31 7	8 8	44 8
292 50	43 6	10 4	59 3
315 00	48 3	14 1	69 5
337 50	46 5	19 1	75 1

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE I WITH EXISTING OFF-RAMP

LOCATION 25

WIND AZIMUTH	UMEAN/UINF (PERCENT)	UPMS/UINF (PERCENT)	UMEAN+1.5*UPMS/UINF (PERCENT)
0.00	23.7	9.1	37.3
22.50	46.7	18.9	74.9
45.00	49.8	22.4	83.4
67.50	66.3	15.5	89.6
90.00	72.2	16.0	96.3
112.50	64.8	13.1	84.4
135.00	57.2	12.8	76.4
157.50	30.8	10.7	46.8
180.00	34.3	12.8	53.4
202.50	55.9	14.9	78.2
225.00	49.1	12.2	67.4
247.50	39.6	11.2	56.5
270.00	19.2	8.8	32.4
292.50	37.7	19.4	66.9
315.00	32.8	15.0	55.3
337.50	30.4	11.8	48.1

LOCATION 26

WIND AZIMUTH	UMEAN/UINF (PERCENT)	UPMS/UINF (PERCENT)	UMEAN+1.5*UPMS/UINF (PERCENT)
0.00	18.8	7.6	30.2
22.50	54.4	21.4	86.6
45.00	66.9	23.3	101.9
67.50	54.2	12.3	72.7
90.00	58.0	13.7	78.5
112.50	68.1	10.7	84.1
135.00	60.2	12.3	78.6
157.50	23.0	8.5	35.7
180.00	27.9	9.6	42.2
202.50	42.1	11.8	59.7
225.00	48.9	12.8	68.0
247.50	41.1	14.7	63.1
270.00	18.6	7.7	30.1
292.50	21.5	9.5	35.7
315.00	23.5	10.6	39.4
337.50	22.0	9.4	36.0

LOCATION 27

WIND AZIMUTH	UMEAN/UINF (PERCENT)	UPMS/UINF (PERCENT)	UMEAN+1.5*UPMS/UINF (PERCENT)
0.00	38.5	13.4	58.6
22.50	27.0	9.0	40.5
45.00	19.7	7.9	31.5
67.50	43.3	10.1	58.4
90.00	63.3	11.9	81.2
112.50	69.9	11.5	87.2
135.00	60.7	10.0	75.7
157.50	56.1	10.7	72.1
180.00	45.9	11.1	62.6
202.50	19.5	8.0	31.6
225.00	29.4	15.0	51.9
247.50	31.4	13.6	51.8
270.00	12.8	7.4	23.9
292.50	25.7	15.1	48.2
315.00	40.7	16.4	65.3
337.50	43.0	16.2	67.3

LOCATION 28

WIND AZIMUTH	UMEAN/UINF (PERCENT)	UPMS/UINF (PERCENT)	UMEAN+1.5*UPMS/UINF (PERCENT)
0.00	16.5	8.9	29.9
22.50	21.3	7.9	33.2
45.00	19.4	5.9	28.2
67.50	27.4	6.4	37.0
90.00	26.1	5.9	34.8
112.50	24.2	6.5	33.9
135.00	19.2	6.3	28.6
157.50	18.2	5.3	26.2
180.00	17.2	5.4	25.4
202.50	31.2	13.8	51.9
225.00	21.9	8.3	34.3
247.50	19.8	8.0	31.8
270.00	14.2	7.8	25.9
292.50	31.5	13.7	52.0
315.00	24.2	12.1	42.4
337.50	22.0	12.0	40.1

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE 1 WITH EXISTING OFF-PAMP

LOCATION 29

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	39.8	15.4	62.9
22.50	29.9	11.8	47.6
45.00	23.3	10.0	38.3
67.50	50.2	16.1	74.4
90.00	59.2	15.4	82.3
112.50	59.5	10.0	74.6
135.00	48.9	8.9	62.2
157.50	39.7	11.5	56.9
180.00	31.4	8.9	44.8
202.50	27.5	8.6	40.4
225.00	29.9	11.9	47.7
247.50	29.9	14.4	51.5
270.00	17.2	9.7	31.7
292.50	26.5	12.9	45.8
315.00	51.8	15.8	75.5
337.50	53.1	15.8	76.8

LOCATION 30

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	20.4	10.1	35.6
22.50	35.4	13.9	56.2
45.00	26.7	9.4	40.8
67.50	26.8	8.8	40.0
90.00	21.5	7.5	32.8
112.50	23.8	9.0	37.3
135.00	42.9	10.6	58.7
157.50	53.7	9.8	68.4
180.00	44.2	18.1	71.4
202.50	25.0	10.7	41.0
225.00	19.1	9.7	33.6
247.50	20.8	10.5	36.4
270.00	18.5	9.9	33.4
292.50	13.3	5.9	22.2
315.00	14.5	6.6	24.4
337.50	24.7	13.5	44.9

LOCATION 31

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	35.0	9.7	49.6
22.50	65.9	11.6	83.4
45.00	56.1	10.3	71.5
67.50	44.7	9.4	58.8
90.00	39.3	9.9	54.1
112.50	34.0	8.6	46.9
135.00	29.1	9.3	43.0
157.50	31.2	9.1	44.8
180.00	37.8	9.7	52.3
202.50	42.4	10.7	58.5
225.00	40.2	10.4	55.8
247.50	33.8	13.1	53.4
270.00	21.8	8.7	34.9
292.50	11.3	6.3	20.7
315.00	13.2	6.6	23.0
337.50	28.2	10.7	44.3

LOCATION 32

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	30.6	19.5	60.0
22.50	26.4	10.8	42.6
45.00	31.7	14.9	54.0
67.50	70.5	14.1	91.6
90.00	74.9	11.1	91.6
112.50	67.3	11.5	84.6
135.00	27.9	11.3	44.9
157.50	27.0	11.1	43.7
180.00	57.8	17.8	84.5
202.50	45.8	15.3	68.7
225.00	71.3	19.8	101.0
247.50	73.2	19.8	102.9
270.00	71.8	20.2	102.2
292.50	74.4	19.9	104.2
315.00	68.3	20.2	98.7
337.50	48.0	23.1	82.7

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE I WITH EXISTING OFF-RAMP

LOCATION 33

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	31.4	9.1	45.1
22.50	74.6	14.8	96.9
45.00	54.6	10.9	71.0
67.50	34.1	12.1	52.2
90.00	34.5	12.1	52.7
112.50	33.8	11.1	50.4
135.00	22.3	10.6	38.2
157.50	19.9	6.7	29.9
180.00	48.0	11.4	65.0
202.50	47.6	12.7	66.7
225.00	41.0	15.3	63.9
247.50	31.5	13.9	52.3
270.00	43.0	16.5	67.8
292.50	18.5	8.3	31.0
315.00	16.2	6.3	25.7
337.50	27.3	10.4	42.9

LOCATION 34

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	16.5	8.1	28.6
22.50	39.2	18.7	67.3
45.00	38.9	14.1	60.1
67.50	37.8	14.3	59.2
90.00	45.6	21.1	77.3
112.50	41.1	19.2	70.0
135.00	26.9	10.8	43.1
157.50	34.0	13.2	53.9
180.00	47.6	13.8	68.3
202.50	49.2	16.1	73.4
225.00	58.6	14.6	80.4
247.50	41.6	17.1	67.2
270.00	44.5	15.9	68.3
292.50	29.2	12.9	48.5
315.00	25.7	9.3	39.7
337.50	17.0	8.3	29.4

LOCATION 35

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	11.2	5.5	19.4
22.50	20.9	8.0	32.9
45.00	18.9	7.4	30.0
67.50	26.8	11.4	43.8
90.00	43.4	12.2	61.7
112.50	40.1	12.1	58.2
135.00	41.6	12.9	61.0
157.50	36.8	14.4	58.4
180.00	21.7	9.0	35.1
202.50	29.4	12.9	48.7
225.00	22.3	12.3	40.7
247.50	14.4	7.3	25.4
270.00	10.6	4.8	17.9
292.50	9.3	4.2	15.6
315.00	9.9	4.2	16.1
337.50	8.5	3.5	13.8

LOCATION 36

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	48.5	15.2	71.4
22.50	50.8	24.2	87.1
45.00	63.7	17.7	90.3
67.50	23.0	9.4	37.1
90.00	19.6	6.5	29.2
112.50	23.5	8.9	36.9
135.00	47.4	17.1	73.0
157.50	58.4	12.5	77.2
180.00	48.8	11.2	65.6
202.50	38.2	10.1	53.4
225.00	31.6	11.0	48.1
247.50	28.7	9.8	43.4
270.00	11.1	5.7	19.6
292.50	8.6	4.3	15.0
315.00	16.9	7.5	28.1
337.50	34.8	12.0	52.8

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE 1 WITH EXISTING OFF-RAMP

LOCATION 37

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	28.8	12.1	46.9
22.50	31.3	14.5	53.1
45.00	24.5	8.4	37.2
67.50	51.9	20.7	82.9
90.00	53.0	14.7	75.1
112.50	66.9	14.8	89.1
135.00	56.9	10.8	73.1
157.50	47.5	11.9	65.4
180.00	42.0	14.5	63.7
202.50	33.9	11.1	50.5
225.00	34.6	10.6	50.5
247.50	30.7	10.1	45.9
270.00	19.7	7.9	31.5
292.50	30.6	10.3	46.1
315.00	29.7	13.2	49.6
337.50	28.5	11.1	45.2

LOCATION 38

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	20.2	9.5	34.5
22.50	25.9	10.4	41.4
45.00	27.3	10.7	43.3
67.50	37.9	14.6	59.8
90.00	42.0	12.5	60.7
112.50	59.5	17.7	86.1
135.00	74.4	13.8	95.2
157.50	60.1	16.7	85.2
180.00	38.1	9.7	52.6
202.50	22.4	7.6	33.8
225.00	19.1	7.9	31.0
247.50	14.6	6.3	24.0
270.00	15.2	6.9	25.5
292.50	10.2	5.1	17.8
315.00	13.9	5.1	21.5
337.50	20.2	8.7	33.2

LOCATION 39

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	32.5	18.0	59.6
22.50	37.5	17.5	63.8
45.00	21.1	9.2	34.9
67.50	22.4	9.2	36.3
90.00	28.3	10.4	43.9
112.50	38.2	13.1	57.8
135.00	48.7	11.7	66.3
157.50	56.3	12.7	75.4
180.00	59.2	11.0	75.7
202.50	43.0	10.7	59.0
225.00	26.2	8.9	39.6
247.50	21.9	7.9	33.9
270.00	13.3	6.1	22.4
292.50	9.6	4.1	15.8
315.00	14.7	7.6	26.1
337.50	32.3	14.4	54.0

LOCATION 40

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	38.8	15.6	62.1
22.50	68.2	20.4	98.9
45.00	60.9	16.1	85.0
67.50	52.9	15.3	75.9
90.00	28.9	11.7	46.5
112.50	24.5	9.4	38.6
135.00	57.5	14.2	78.8
157.50	64.8	12.9	84.2
180.00	77.1	14.8	94.8
202.50	58.8	10.7	74.8
225.00	33.9	10.4	49.5
247.50	24.0	8.8	37.1
270.00	18.2	8.7	31.3
292.50	16.4	6.6	26.3
315.00	16.6	8.0	28.6
337.50	31.0	13.1	50.6

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE I WITH EXISTING OFF-RAMP

LOCATION 41

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	40.0	15.5	63.3
22.50	58.5	15.8	82.1
45.00	42.2	14.4	63.8
67.50	41.9	12.0	60.0
90.00	24.8	8.3	37.2
112.50	35.6	13.1	55.2
135.00	35.6	13.8	56.3
157.50	66.6	15.6	90.0
180.00	75.2	12.2	93.4
202.50	56.1	12.7	75.1
225.00	36.6	13.4	56.7
247.50	32.6	12.4	51.3
270.00	21.0	9.5	35.2
292.50	18.8	7.7	30.3
315.00	18.7	7.3	29.6
337.50	35.3	13.5	55.6

LOCATION 42

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	36.0	12.3	54.4
22.50	48.3	15.7	71.9
45.00	26.8	11.8	44.5
67.50	24.7	11.5	41.9
90.00	17.2	7.1	27.8
112.50	26.0	10.6	41.9
135.00	33.7	13.7	54.3
157.50	40.9	17.3	66.9
180.00	34.7	16.4	59.3
202.50	35.1	15.7	58.7
225.00	33.6	15.7	57.1
247.50	22.3	10.2	37.5
270.00	18.6	6.8	28.8
292.50	15.8	5.0	23.4
315.00	25.2	7.9	37.1
337.50	39.6	11.8	57.3

LOCATION 43

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	27.7	11.5	45.1
22.50	46.1	15.6	69.4
45.00	29.0	11.8	46.6
67.50	28.2	11.0	44.6
90.00	22.4	8.6	35.2
112.50	34.5	17.7	61.0
135.00	61.1	14.9	83.5
157.50	65.2	20.2	95.5
180.00	35.8	16.5	60.5
202.50	29.6	13.3	49.5
225.00	27.4	10.6	43.3
247.50	15.1	5.4	23.2
270.00	13.9	5.2	21.7
292.50	16.0	5.4	24.2
315.00	15.7	5.4	23.8
337.50	29.1	13.2	48.9

LOCATION 44

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	29.0	14.3	50.5
22.50	27.5	12.4	46.1
45.00	19.1	8.0	31.1
67.50	16.5	6.8	26.6
90.00	16.5	7.0	27.0
112.50	40.1	20.5	70.9
135.00	62.7	13.9	83.6
157.50	72.0	15.2	94.9
180.00	60.2	23.4	95.3
202.50	27.2	12.1	45.4
225.00	17.6	6.9	27.9
247.50	13.7	4.1	19.8
270.00	19.0	6.8	29.1
292.50	19.6	7.2	30.4
315.00	17.7	6.7	27.7
337.50	38.9	18.4	66.6

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE I WITH EXISTING OFF-RAMP

LOCATION 45

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1 5*URMS/U1NF (PERCENT)
0 00	40 3	14 1	61 5
22 50	27 5	14 1	48 7
45 00	27 4	12 6	46 3
67 50	24 3	10 8	40 5
90 00	24 2	10 6	40 2
112 50	62 1	23 6	97 5
135 00	67 1	14 7	89 2
157 50	73 2	14 0	94 1
180 00	69 8	19 2	98 5
202 50	38 3	16 3	62 7
225 00	18 7	6 9	29 0
247 50	16.1	4 8	23 4
270 00	15 5	5 4	23 7
292 50	17 2	6 6	27 1
315 00	26 4	12 4	45 1
337 50	52 6	17 7	79 2

LOCATION 46

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1 5*URMS/U1NF (PERCENT)
0 00	34 5	10 2	49 8
22 50	46 9	19 8	76 6
45 00	42 2	13 6	62 6
67 50	46 0	15 9	69 9
90 00	33 9	13 6	54 3
112 50	68 4	25 8	107 1
135 00	66 9	22 8	101 1
157 50	39 5	19 4	68 6
180 00	31 8	14 1	53 0
202 50	26 6	13 1	46 3
225 00	20 4	7 7	31 8
247 50	14 5	5 1	22 2
270 00	11 2	3 8	16 9
292 50	13 1	5 3	21 0
315 00	25 7	8 5	38 5
337 50	38 2	13 4	58 2

LOCATION 47

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1 5*URMS/U1NF (PERCENT)
0 00	39 7	17 1	65 2
22 50	61 3	27 8	103 0
45 00	31 0	13 3	51 0
67 50	36 5	11 0	52 9
90 00	30 1	11 3	47 1
112 50	31 0	9 8	45 7
135 00	36 4	13 4	56 6
157 50	47 8	12 9	67 2
180 00	53 6	12 8	72 8
202 50	52 6	15 0	75 1
225 00	42 8	14 8	65 0
247 50	44 7	16 0	68 7
270 00	51 4	14 1	72 5
292 50	61 3	14 1	82 4
315 00	59 0	14 0	79 9
337 50	40.4	18 0	67 4

LOCATION 48

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1 5*URMS/U1NF (PERCENT)
0 00	23 4	9 2	37 2
22 50	46 9	16 7	71 9
45 00	43 6	16 4	68 1
67 50	37 3	12 7	56 3
90 00	24 9	9 4	38 9
112 50	38 9	17 0	64 4
135 00	45 5	19 9	75 3
157 50	41 8	21 4	73 9
180 00	24 8	11 4	42 0
202 50	27 3	12 6	46 2
225 00	23 1	12 8	42 4
247 50	17 7	8 5	30 4
270 00	18 9	8 0	30 9
292 50	14 5	4 7	21 6
315 00	16 4	6 1	25 5
337 50	22.1	8 8	35 2

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE I WITH EXISTING OFF-RAMP

LOCATION 49

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	24.3	9.8	39.0
22.50	46.0	17.7	72.6
45.00	40.2	16.1	64.3
67.50	36.5	15.1	59.2
90.00	31.7	12.9	51.1
112.50	47.7	20.9	79.1
135.00	41.1	20.4	71.7
157.50	34.2	17.7	60.8
180.00	31.1	17.9	57.9
202.50	29.0	12.9	48.3
225.00	20.0	9.2	33.8
247.50	14.4	5.9	23.2
270.00	14.4	6.2	23.7
292.50	16.7	6.8	26.9
315.00	19.0	7.4	30.1
337.50	24.5	9.7	39.1

LOCATION 50

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	39.0	15.4	62.1
22.50	51.1	23.5	86.4
45.00	43.5	17.8	70.2
67.50	45.4	15.9	69.2
90.00	33.5	12.8	52.7
112.50	56.9	25.8	95.6
135.00	77.1	22.0	110.1
157.50	49.2	23.0	83.7
180.00	44.6	18.9	73.0
202.50	36.8	12.3	55.2
225.00	36.8	13.7	57.4
247.50	50.2	17.1	75.9
270.00	13.1	5.2	20.8
292.50	19.1	8.7	32.2
315.00	39.1	13.9	59.9
337.50	52.3	16.3	76.8

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 1

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	51.4	16.3	75.9
22.50	37.5	10.2	52.7
45.00	36.3	8.2	48.5
67.50	38.3	8.3	50.8
90.00	33.3	7.8	45.0
112.50	23.6	10.4	39.2
135.00	17.1	6.4	26.8
157.50	27.6	8.2	39.8
180.00	26.2	6.8	36.3
202.50	22.4	6.2	31.6
225.00	43.1	18.2	70.4
247.50	36.9	18.2	64.3
270.00	30.3	13.9	50.6
292.50	33.8	13.6	54.0
315.00	36.5	13.6	56.6
337.50	36.7	13.9	57.6

LOCATION 2

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	32.9	10.0	47.8
22.50	54.0	11.8	71.7
45.00	39.5	13.3	59.5
67.50	29.5	7.4	40.7
90.00	46.0	14.0	67.1
112.50	60.7	15.8	84.3
135.00	62.6	11.9	80.5
157.50	57.7	9.6	72.1
180.00	49.1	11.0	65.6
202.50	25.8	10.7	41.8
225.00	25.5	12.4	44.4
247.50	45.8	14.2	67.2
270.00	50.4	15.4	73.6
292.50	47.0	15.8	70.5
315.00	43.5	14.3	65.0
337.50	55.2	15.5	82.5

LOCATION 3

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	22.2	9.6	36.5
22.50	20.8	9.3	34.7
45.00	32.6	12.2	50.9
67.50	19.0	7.9	30.8
90.00	31.4	12.1	49.6
112.50	43.1	14.2	64.4
135.00	36.7	12.8	56.0
157.50	29.3	9.4	43.4
180.00	21.6	8.9	34.9
202.50	35.3	13.8	56.1
225.00	31.9	9.1	45.6
247.50	35.3	11.9	53.1
270.00	35.0	13.4	55.2
292.50	31.8	11.3	48.8
315.00	33.4	14.1	54.6
337.50	17.4	6.6	27.3

LOCATION 4

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	21.1	8.1	33.3
22.50	11.7	4.0	17.7
45.00	28.3	9.0	41.8
67.50	27.9	8.7	41.0
90.00	30.8	11.9	48.7
112.50	45.5	13.5	65.8
135.00	27.6	11.6	45.0
157.50	20.1	7.0	30.6
180.00	19.8	8.2	32.1
202.50	33.4	13.6	53.8
225.00	33.9	11.5	51.1
247.50	37.4	13.4	57.5
270.00	39.2	13.8	60.0
292.50	46.2	14.5	68.0
315.00	43.5	14.5	65.3
337.50	24.7	10.5	40.5

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 5

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	18.8	5.9	27.7
22.50	31.6	8.1	43.8
45.00	41.6	13.3	61.5
67.50	25.9	10.1	41.1
90.00	27.1	8.9	40.5
112.50	25.8	8.1	38.0
135.00	43.6	15.5	66.8
157.50	49.2	15.5	72.4
180.00	48.9	15.7	72.4
202.50	54.6	13.3	74.5
225.00	38.0	16.7	63.1
247.50	14.9	6.5	24.7
270.00	14.9	6.7	25.0
292.50	14.7	7.1	25.4
315.00	14.8	6.8	25.0
337.50	15.5	6.5	25.3

LOCATION 6

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	33.8	6.8	44.0
22.50	42.7	8.0	54.7
45.00	40.5	13.6	60.9
67.50	16.3	7.2	27.2
90.00	38.4	11.4	55.5
112.50	32.2	11.3	49.1
135.00	35.4	10.2	50.7
157.50	42.5	9.5	56.7
180.00	30.6	10.0	45.6
202.50	28.5	10.7	44.6
225.00	41.6	10.8	57.8
247.50	37.9	12.6	56.7
270.00	29.7	13.6	50.1
292.50	15.3	6.6	25.3
315.00	16.9	6.3	26.4
337.50	22.7	7.3	33.6

LOCATION 7

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	27.7	11.1	44.4
22.50	36.1	11.6	53.4
45.00	37.0	12.0	55.0
67.50	23.7	9.6	38.1
90.00	19.6	8.7	32.7
112.50	28.6	12.3	47.1
135.00	21.6	9.7	36.1
157.50	19.8	8.8	33.0
180.00	21.2	8.6	34.2
202.50	21.9	9.5	36.2
225.00	18.6	7.5	29.8
247.50	15.2	6.5	24.9
270.00	26.3	10.2	41.6
292.50	27.2	9.1	40.9
315.00	24.9	9.0	38.4
337.50	17.1	6.3	26.6

LOCATION 8

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	27.1	10.9	43.4
22.50	42.2	15.1	64.8
45.00	49.3	16.5	74.1
67.50	32.6	12.5	51.4
90.00	21.3	8.6	34.2
112.50	23.4	9.7	37.9
135.00	31.7	12.3	50.3
157.50	26.4	10.6	42.4
180.00	24.8	10.1	40.1
202.50	25.2	9.4	39.3
225.00	29.1	12.7	48.3
247.50	33.8	12.2	52.0
270.00	18.2	8.3	30.7
292.50	19.7	8.4	32.3
315.00	22.3	7.6	33.8
337.50	26.5	8.5	39.2

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 9

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	32.7	11.1	49.3
22.50	35.5	13.8	56.2
45.00	47.3	14.6	69.2
67.50	43.4	10.8	59.6
90.00	25.4	9.6	39.8
112.50	25.7	11.1	42.4
135.00	29.0	11.3	46.0
157.50	33.7	13.5	54.0
180.00	32.7	13.4	52.7
202.50	28.6	9.6	43.0
225.00	20.9	8.1	33.0
247.50	17.4	7.3	28.4
270.00	18.6	8.1	30.8
292.50	18.4	7.1	29.0
315.00	17.7	7.0	28.3
337.50	29.9	8.8	43.2

LOCATION 10

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	21.0	7.6	32.5
22.50	30.8	14.1	51.9
45.00	20.2	9.1	33.9
67.50	37.8	10.8	54.0
90.00	34.0	8.5	46.8
112.50	41.5	11.1	58.2
135.00	31.5	10.4	47.1
157.50	33.9	9.6	48.3
180.00	36.1	9.7	50.6
202.50	35.2	8.6	48.2
225.00	31.2	9.4	45.2
247.50	14.8	6.5	24.4
270.00	29.5	9.2	43.3
292.50	33.2	9.6	47.5
315.00	28.0	7.6	39.4
337.50	22.8	7.6	34.2

LOCATION 11

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	35.9	11.4	53.0
22.50	33.0	7.8	44.8
45.00	43.1	10.5	58.9
67.50	31.4	10.0	46.4
90.00	38.1	9.7	52.6
112.50	29.9	10.0	45.0
135.00	26.1	10.0	41.2
157.50	48.8	14.6	70.7
180.00	38.7	15.1	61.4
202.50	30.1	14.9	52.3
225.00	18.4	9.0	31.9
247.50	34.1	13.7	54.6
270.00	36.6	13.7	57.2
292.50	31.3	11.7	48.9
315.00	28.4	9.9	43.3
337.50	25.1	7.9	37.0

LOCATION 12

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	24.0	9.9	38.9
22.50	27.2	8.3	39.7
45.00	30.8	8.1	43.0
67.50	38.7	11.1	55.4
90.00	39.1	10.0	54.0
112.50	38.0	10.6	53.9
135.00	21.9	8.9	35.1
157.50	29.0	13.1	48.6
180.00	37.5	13.3	57.5
202.50	36.5	11.4	53.7
225.00	26.8	8.5	39.6
247.50	11.8	4.5	18.5
270.00	20.5	8.2	32.8
292.50	20.9	8.0	32.9
315.00	18.4	7.2	29.3
337.50	15.4	6.2	24.6

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 13

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	37.2	10.3	52.7
22.50	42.7	8.3	55.2
45.00	45.0	11.5	62.3
67.50	24.9	8.1	37.1
90.00	18.1	5.9	27.0
112.50	24.2	8.4	36.8
135.00	36.0	8.8	49.2
157.50	39.2	12.5	57.9
180.00	28.9	13.6	49.2
202.50	19.5	6.9	29.9
225.00	30.6	9.4	44.7
247.50	18.9	7.2	29.7
270.00	24.4	9.0	37.8
292.50	29.2	9.4	43.3
315.00	25.0	9.4	39.1
337.50	28.3	8.5	41.1

LOCATION 14

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	17.9	7.4	29.0
22.50	17.7	6.1	26.9
45.00	21.2	7.9	33.0
67.50	19.3	7.4	30.4
90.00	17.3	7.0	27.9
112.50	20.6	9.4	34.7
135.00	40.5	9.5	54.8
157.50	51.2	14.2	72.5
180.00	50.6	14.5	72.3
202.50	47.2	13.7	67.7
225.00	20.1	7.6	31.6
247.50	12.8	5.1	20.5
270.00	22.9	10.4	38.6
292.50	19.0	8.0	31.0
315.00	14.7	6.7	24.7
337.50	12.9	5.2	20.7

LOCATION 15

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	27.9	7.6	39.2
22.50	38.9	8.4	51.5
45.00	45.4	12.2	63.7
67.50	36.5	12.3	54.9
90.00	20.3	7.4	31.4
112.50	28.5	11.4	45.5
135.00	50.3	11.7	67.8
157.50	71.8	15.0	94.3
180.00	64.4	16.4	89.0
202.50	41.7	10.2	57.0
225.00	40.8	8.9	54.2
247.50	19.9	8.5	32.7
270.00	24.1	10.0	39.1
292.50	23.6	8.8	36.8
315.00	20.3	7.6	31.6
337.50	23.0	6.1	32.1

LOCATION 16

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	25.5	8.3	37.9
22.50	23.8	5.8	32.4
45.00	29.9	7.9	41.7
67.50	19.9	8.3	32.4
90.00	25.0	7.4	36.1
112.50	30.1	9.2	44.0
135.00	27.8	7.0	38.3
157.50	22.1	8.0	34.1
180.00	17.9	7.2	28.7
202.50	15.1	5.2	22.9
225.00	29.4	13.2	49.2
247.50	30.3	12.3	48.7
270.00	19.1	9.0	32.6
292.50	19.8	8.5	32.5
315.00	29.7	10.4	45.4
337.50	23.3	9.1	37.0

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 17

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	15.8	6.1	24.9
22.50	21.7	10.5	37.5
45.00	33.7	9.6	48.0
67.50	27.4	8.2	39.7
90.00	22.9	8.1	35.1
112.50	49.3	13.8	70.0
135.00	20.3	7.8	32.1
157.50	20.3	6.4	29.9
180.00	22.2	7.5	33.4
202.50	19.3	5.7	27.9
225.00	17.2	5.1	24.9
247.50	15.4	6.0	24.4
270.00	24.3	7.6	35.7
292.50	23.8	8.0	35.8
315.00	15.2	6.4	24.8
337.50	14.3	4.8	21.5

LOCATION 18

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	30.2	11.3	47.2
22.50	37.9	14.1	59.1
45.00	36.3	12.2	54.6
67.50	23.6	7.9	35.4
90.00	16.3	5.6	24.7
112.50	28.4	10.5	44.2
135.00	51.7	16.4	76.3
157.50	72.1	15.5	95.3
180.00	74.3	14.6	96.2
202.50	61.4	12.3	79.9
225.00	58.8	10.6	74.7
247.50	34.8	9.9	49.6
270.00	13.5	5.2	21.3
292.50	11.0	4.0	16.9
315.00	17.4	7.4	28.5
337.50	24.5	9.4	38.6

LOCATION 19

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	24.2	8.4	36.8
22.50	41.7	10.9	58.0
45.00	33.3	12.3	51.8
67.50	22.3	8.9	35.7
90.00	19.9	8.1	31.2
112.50	35.2	19.0	63.7
135.00	45.2	21.3	77.2
157.50	47.0	12.3	65.5
180.00	52.8	12.9	72.2
202.50	46.3	10.3	61.8
225.00	43.1	9.7	57.7
247.50	22.8	7.7	34.4
270.00	11.7	4.3	18.2
292.50	14.0	4.6	20.9
315.00	19.1	6.1	28.3
337.50	24.3	8.0	36.3

LOCATION 20

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	23.5	8.9	35.4
22.50	23.6	9.0	37.1
45.00	25.0	9.0	38.5
67.50	23.4	8.4	36.0
90.00	24.3	8.1	36.5
112.50	59.9	11.1	76.6
135.00	58.7	13.9	79.6
157.50	36.3	14.8	58.6
180.00	53.4	14.3	74.9
202.50	42.2	13.5	62.5
225.00	25.5	12.4	44.1
247.50	11.8	4.9	19.1
270.00	16.8	4.8	24.0
292.50	10.8	3.3	15.8
315.00	21.0	6.9	31.3
337.50	28.4	9.3	42.4

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 21

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	13.9	4.8	21.2
22.50	33.0	16.4	57.6
45.00	23.0	9.1	36.7
67.50	20.9	7.2	31.7
90.00	24.0	8.6	36.9
112.50	48.3	15.9	72.1
135.00	51.4	11.3	68.5
157.50	49.9	9.8	64.6
180.00	41.1	12.8	60.4
202.50	23.3	8.6	36.2
225.00	12.1	3.7	17.6
247.50	11.4	3.4	16.4
270.00	11.5	4.1	17.6
292.50	13.7	4.6	20.6
315.00	12.8	4.2	19.1
337.50	13.9	4.7	20.9

LOCATION 22

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	15.6	5.8	24.3
22.50	25.6	11.4	42.7
45.00	40.3	16.2	64.6
67.50	25.0	9.7	39.6
90.00	39.0	13.4	59.1
112.50	33.9	10.3	49.3
135.00	31.9	11.7	49.5
157.50	23.3	9.4	37.4
180.00	16.0	5.1	23.6
202.50	15.6	4.4	22.3
225.00	13.2	4.6	20.1
247.50	20.2	7.9	32.1
270.00	16.2	6.5	26.0
292.50	12.8	4.2	19.1
315.00	16.3	6.0	25.2
337.50	16.7	6.0	25.7

LOCATION 23

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	24.8	10.1	40.0
22.50	35.9	15.3	58.9
45.00	29.1	11.1	45.8
67.50	33.7	15.9	57.6
90.00	42.2	18.4	69.8
112.50	38.2	17.3	64.2
135.00	31.2	13.1	50.9
157.50	28.5	11.2	45.2
180.00	28.2	10.2	43.5
202.50	37.4	11.2	54.1
225.00	19.9	7.2	30.8
247.50	16.9	6.7	26.9
270.00	26.3	11.1	42.9
292.50	19.0	7.7	30.6
315.00	28.2	11.8	45.9
337.50	24.7	9.9	39.5

LOCATION 24

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	46.2	19.8	75.9
22.50	42.8	18.2	70.1
45.00	59.6	16.8	84.8
67.50	55.9	15.4	79.0
90.00	74.4	15.4	97.5
112.50	90.3	11.1	107.0
135.00	82.6	13.5	102.9
157.50	67.0	18.4	94.6
180.00	38.5	18.4	66.0
202.50	33.4	14.4	54.9
225.00	25.1	9.9	40.0
247.50	28.8	11.4	46.0
270.00	26.9	9.6	41.4
292.50	34.6	10.9	50.9
315.00	45.0	17.3	70.9
337.50	49.4	20.7	80.5

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 25

WIND AZIMUTH	UMEAN/U1INF (PERCENT)	URMS/U1INF (PERCENT)	UMEAN+1.5*URMS/U1INF (PERCENT)
0.00	24.2	8.6	37.2
22.50	44.6	17.4	70.7
45.00	49.3	21.3	81.3
67.50	69.6	16.5	94.3
90.00	78.9	15.2	101.7
112.50	63.4	13.8	84.2
135.00	60.9	14.4	82.4
157.50	36.3	10.8	52.5
180.00	37.4	12.3	55.8
202.50	58.8	16.1	82.9
225.00	53.7	11.7	71.3
247.50	39.8	11.9	57.6
270.00	21.4	9.6	35.9
292.50	42.3	19.4	71.4
315.00	36.7	16.1	60.9
337.50	31.9	12.1	50.0

LOCATION 26

WIND AZIMUTH	UMEAN/U1INF (PERCENT)	URMS/U1INF (PERCENT)	UMEAN+1.5*URMS/U1INF (PERCENT)
0.00	20.8	8.7	33.8
22.50	51.3	21.3	83.3
45.00	67.8	22.9	102.1
67.50	53.0	12.6	72.0
90.00	55.5	14.4	77.1
112.50	66.7	11.3	83.7
135.00	55.8	16.8	80.9
157.50	20.8	6.9	31.1
180.00	28.8	9.0	42.2
202.50	50.9	15.7	74.5
225.00	51.5	13.1	71.2
247.50	41.1	15.0	63.6
270.00	21.8	8.8	34.9
292.50	25.7	11.4	42.9
315.00	26.8	12.0	44.7
337.50	25.2	10.7	41.3

LOCATION 27

WIND AZIMUTH	UMEAN/U1INF (PERCENT)	URMS/U1INF (PERCENT)	UMEAN+1.5*URMS/U1INF (PERCENT)
0.00	36.9	14.6	58.8
22.50	31.9	10.5	47.6
45.00	15.8	5.9	24.7
67.50	42.3	11.1	58.9
90.00	60.6	11.7	78.0
112.50	68.1	11.2	84.8
135.00	49.6	13.4	69.7
157.50	47.1	13.3	67.0
180.00	37.0	12.1	55.2
202.50	19.9	8.4	32.5
225.00	20.4	11.9	38.2
247.50	24.8	13.3	44.8
270.00	17.5	8.1	29.6
292.50	24.2	11.9	42.0
315.00	42.7	17.2	68.5
337.50	40.6	16.7	65.7

LOCATION 28

WIND AZIMUTH	UMEAN/U1INF (PERCENT)	URMS/U1INF (PERCENT)	UMEAN+1.5*URMS/U1INF (PERCENT)
0.00	26.8	11.1	43.5
22.50	23.7	8.3	36.1
45.00	19.9	6.1	29.0
67.50	28.6	7.7	40.1
90.00	28.5	6.8	38.7
112.50	23.2	6.6	33.1
135.00	19.2	6.7	29.3
157.50	17.8	5.7	26.2
180.00	21.4	7.7	33.0
202.50	44.2	14.8	66.4
225.00	41.2	12.7	60.3
247.50	32.7	14.4	54.4
270.00	25.1	9.0	38.6
292.50	44.8	14.5	66.5
315.00	33.6	13.1	53.3
337.50	31.9	13.2	51.8

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 29

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	54.3	12.2	72.7
22.50	38.2	15.2	61.0
45.00	28.3	13.0	47.8
67.50	54.8	15.8	78.5
90.00	62.9	15.5	86.2
112.50	59.8	11.8	77.6
135.00	55.7	9.0	69.2
157.50	45.7	11.9	63.5
180.00	39.0	10.4	54.5
202.50	41.7	10.9	58.1
225.00	43.0	10.4	58.6
247.50	41.7	13.4	61.8
270.00	26.2	11.4	43.4
292.50	47.2	12.6	66.2
315.00	56.9	13.4	77.0
337.50	55.7	13.5	76.0

LOCATION 30

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	21.1	7.0	31.7
22.50	29.7	12.8	48.9
45.00	23.2	8.7	36.3
67.50	31.6	10.2	46.9
90.00	25.4	8.6	38.4
112.50	26.0	9.4	40.1
135.00	44.7	13.8	65.4
157.50	60.1	10.7	76.1
180.00	54.8	20.5	85.5
202.50	29.7	11.3	46.7
225.00	23.2	9.0	36.7
247.50	24.6	10.8	40.8
270.00	22.4	9.1	36.1
292.50	17.0	5.6	25.4
315.00	18.8	6.9	29.1
337.50	26.8	12.7	45.9

LOCATION 31

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	30.1	10.6	45.9
22.50	63.2	10.3	78.6
45.00	58.5	10.9	74.9
67.50	52.7	9.7	67.3
90.00	43.3	9.3	57.2
112.50	33.0	9.6	47.4
135.00	31.1	10.5	46.8
157.50	38.8	10.7	54.8
180.00	44.0	10.7	60.1
202.50	49.1	10.2	64.5
225.00	45.8	10.9	62.2
247.50	41.0	13.1	60.6
270.00	26.5	9.4	40.7
292.50	14.8	5.2	22.6
315.00	16.4	6.3	25.8
337.50	36.0	10.8	52.3

LOCATION 32

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	35.9	20.4	66.5
22.50	28.8	11.3	45.8
45.00	37.9	18.2	65.2
67.50	67.5	15.2	90.2
90.00	73.4	12.0	91.4
112.50	68.6	12.2	86.9
135.00	36.3	12.5	55.1
157.50	23.5	8.4	36.1
180.00	51.1	16.1	75.3
202.50	48.2	16.3	72.7
225.00	80.7	20.7	111.7
247.50	84.1	20.6	115.0
270.00	80.7	22.6	114.6
292.50	85.3	19.8	115.1
315.00	83.1	20.8	114.2
337.50	73.8	21.1	105.4

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 33

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	51.6	11.5	68.9
22.50	69.8	13.4	89.8
45.00	54.1	12.2	72.4
67.50	33.3	12.9	52.7
90.00	38.7	13.5	58.9
112.50	38.4	11.7	56.0
135.00	36.3	13.4	56.5
157.50	24.6	7.6	35.9
180.00	54.8	13.8	75.5
202.50	51.8	13.2	71.5
225.00	36.1	12.5	54.9
247.50	31.3	11.5	48.6
270.00	39.2	14.9	61.5
292.50	23.3	9.5	37.5
315.00	29.3	14.7	51.2
337.50	49.7	14.9	72.1

LOCATION 34

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	22.2	10.2	37.4
22.50	41.7	16.9	67.1
45.00	44.5	12.9	63.9
67.50	43.9	15.1	66.6
90.00	47.2	19.6	76.6
112.50	39.3	18.0	66.2
135.00	29.0	12.6	47.9
157.50	35.2	12.0	53.3
180.00	47.8	13.3	67.8
202.50	50.7	13.2	70.5
225.00	55.1	17.1	80.8
247.50	40.1	16.5	64.9
270.00	40.3	16.7	65.4
292.50	25.5	11.1	42.2
315.00	25.1	7.8	36.7
337.50	21.7	9.3	35.7

LOCATION 35

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	15.5	6.1	24.6
22.50	26.4	9.2	40.2
45.00	18.0	5.7	26.6
67.50	26.4	11.0	42.9
90.00	37.4	13.2	57.2
112.50	35.5	11.6	53.0
135.00	40.6	13.3	60.6
157.50	41.7	14.7	63.7
180.00	21.6	8.5	34.4
202.50	29.9	12.5	48.6
225.00	27.1	10.1	42.3
247.50	17.5	7.1	28.2
270.00	17.3	6.7	27.3
292.50	17.8	7.0	28.3
315.00	13.7	4.5	20.4
337.50	17.4	6.3	26.8

LOCATION 36

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	29.0	12.2	47.3
22.50	31.8	13.9	52.6
45.00	45.7	18.3	73.2
67.50	33.8	14.0	54.8
90.00	23.1	9.2	37.0
112.50	33.7	15.9	57.4
135.00	44.0	16.8	69.3
157.50	56.9	11.6	74.3
180.00	46.6	10.2	61.9
202.50	35.5	9.7	50.0
225.00	28.7	10.5	44.4
247.50	25.2	8.2	37.6
270.00	13.0	4.8	20.2
292.50	12.9	4.5	19.6
315.00	25.2	8.0	37.3
337.50	32.4	10.8	48.6

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 37

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	28.2	10.0	43.2
22.50	30.1	12.6	49.0
45.00	22.2	8.2	34.5
67.50	69.3	13.0	88.8
90.00	68.4	15.1	91.1
112.50	74.7	13.1	94.4
135.00	55.9	11.6	73.3
157.50	46.9	11.1	63.6
180.00	35.8	12.0	53.7
202.50	34.8	11.2	51.6
225.00	37.1	10.0	52.1
247.50	34.1	11.0	50.5
270.00	23.8	9.2	37.6
292.50	32.2	10.0	47.1
315.00	30.4	9.4	44.5
337.50	50.7	12.4	69.3

LOCATION 38

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	22.8	8.1	34.9
22.50	27.0	10.4	42.5
45.00	24.7	10.2	40.0
67.50	52.2	20.5	82.9
90.00	44.5	18.9	72.9
112.50	79.5	21.6	111.9
135.00	71.4	15.1	94.1
157.50	58.3	15.6	81.7
180.00	37.5	9.8	52.1
202.50	23.6	8.1	35.7
225.00	22.7	8.2	35.0
247.50	17.4	5.9	26.2
270.00	18.3	6.9	28.7
292.50	12.8	4.8	20.1
315.00	22.0	6.0	31.1
337.50	31.4	7.7	43.0

LOCATION 39

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	30.2	10.6	46.1
22.50	26.2	9.9	41.1
45.00	38.7	15.4	61.8
67.50	27.7	11.3	44.6
90.00	26.8	10.6	42.8
112.50	43.7	16.8	68.9
135.00	45.9	13.6	66.3
157.50	53.4	12.4	72.1
180.00	52.1	10.5	67.8
202.50	39.1	10.7	55.2
225.00	27.0	8.3	39.5
247.50	23.6	7.8	35.2
270.00	17.5	6.5	27.3
292.50	12.1	3.6	17.5
315.00	24.5	6.6	34.4
337.50	34.6	9.4	48.8

LOCATION 40

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	33.9	14.1	55.0
22.50	46.0	19.5	75.2
45.00	65.0	18.5	92.8
67.50	37.2	14.0	58.2
90.00	21.8	7.9	33.6
112.50	26.9	11.2	43.7
135.00	46.9	12.9	66.2
157.50	56.2	13.5	76.5
180.00	58.4	10.8	74.5
202.50	49.6	10.8	65.8
225.00	37.3	9.5	51.5
247.50	28.6	8.3	41.0
270.00	17.0	6.5	26.8
292.50	14.6	5.2	22.4
315.00	22.8	8.3	35.3
337.50	33.8	12.3	52.3

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 41

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	39.5	13.2	59.4
22.50	63.5	16.0	87.5
45.00	65.7	15.0	88.2
67.50	39.6	9.6	54.0
90.00	24.1	7.1	34.8
112.50	24.5	9.4	38.6
135.00	45.5	13.0	65.0
157.50	61.1	12.7	80.2
180.00	66.2	11.6	83.6
202.50	51.8	12.1	70.0
225.00	35.9	12.0	54.0
247.50	24.2	9.3	38.1
270.00	18.1	8.3	30.5
292.50	15.0	4.7	22.1
315.00	25.6	7.0	36.1
337.50	35.7	10.8	51.9

LOCATION 42

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	22.2	8.1	34.3
22.50	45.4	12.9	64.8
45.00	39.5	12.5	58.3
67.50	29.4	9.0	42.9
90.00	17.6	7.3	28.5
112.50	34.9	12.9	54.3
135.00	21.2	9.1	34.8
157.50	23.8	11.3	40.7
180.00	17.7	6.3	27.2
202.50	18.2	7.3	29.1
225.00	18.4	7.9	30.2
247.50	10.0	3.5	15.2
270.00	9.6	3.5	14.9
292.50	11.9	3.7	17.5
315.00	14.8	4.9	22.2
337.50	20.5	7.6	31.9

LOCATION 43

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	18.5	7.2	29.2
22.50	25.5	11.6	42.9
45.00	17.2	5.6	25.6
67.50	26.1	9.5	40.3
90.00	22.6	9.8	37.3
112.50	56.6	17.3	82.6
135.00	22.8	9.7	37.4
157.50	22.6	9.5	36.9
180.00	18.9	6.8	29.0
202.50	17.0	6.0	26.0
225.00	14.6	5.2	22.5
247.50	9.1	2.6	13.1
270.00	9.6	2.6	13.6
292.50	11.5	3.3	16.5
315.00	15.5	5.7	24.1
337.50	20.0	8.2	32.4

LOCATION 44

WIND AZIMUTH	UMEAN/UINF (PERCENT)	URMS/UINF (PERCENT)	UMEAN+1.5*URMS/UINF (PERCENT)
0.00	35.7	9.4	49.8
22.50	50.6	14.0	71.6
45.00	48.8	13.5	69.1
67.50	38.1	12.6	57.0
90.00	40.8	12.6	59.7
112.50	71.7	13.2	91.5
135.00	74.0	17.3	100.0
157.50	46.9	17.6	73.3
180.00	21.6	9.0	35.2
202.50	14.8	4.5	21.6
225.00	15.8	5.4	23.9
247.50	12.8	4.2	19.1
270.00	15.0	5.2	22.7
292.50	13.2	4.6	20.2
315.00	34.2	9.1	47.9
337.50	41.8	12.4	60.5

TABLE 2--PEDESTRIAN WIND VELOCITIES AND TURBULENCE INTENSITIES

INTERNATIONAL PLACE PHASE II WITH NEW OFF-RAMP

LOCATION 45

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	40.6	18.4	68.1
22.50	55.4	23.4	90.5
45.00	32.4	16.8	57.6
67.50	24.2	8.3	36.7
90.00	22.5	7.2	33.3
112.50	37.3	13.2	57.1
135.00	56.0	23.6	91.3
157.50	62.8	24.0	98.8
180.00	66.6	20.9	98.0
202.50	40.8	15.1	63.4
225.00	11.6	4.6	18.5
247.50	10.6	3.8	16.3
270.00	13.7	5.3	21.6
292.50	14.9	6.0	23.9
315.00	27.1	11.0	43.6
337.50	33.0	13.9	53.9

LOCATION 46

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	51.8	15.8	75.5
22.50	50.3	19.3	79.3
45.00	26.2	8.9	39.6
67.50	28.1	11.3	45.1
90.00	25.9	9.9	40.8
112.50	27.2	8.8	40.4
135.00	39.7	11.4	56.8
157.50	55.0	11.9	72.8
180.00	62.1	14.3	83.5
202.50	33.6	14.1	54.8
225.00	11.4	4.3	17.9
247.50	10.1	3.6	15.6
270.00	10.7	4.1	16.8
292.50	30.6	9.5	44.9
315.00	51.0	13.1	70.6
337.50	64.0	18.0	91.0

LOCATION 47

WIND AZIMUTH	UMEAN/U1NF (PERCENT)	URMS/U1NF (PERCENT)	UMEAN+1.5*URMS/U1NF (PERCENT)
0.00	36.9	15.8	60.5
22.50	36.3	17.4	62.4
45.00	26.8	11.4	43.9
67.50	45.2	11.7	62.8
90.00	35.7	14.5	57.5
112.50	28.4	11.6	45.8
135.00	30.0	12.2	48.4
157.50	46.9	14.7	68.9
180.00	55.6	13.0	75.2
202.50	52.8	14.6	74.7
225.00	39.7	14.2	61.1
247.50	31.3	11.3	48.3
270.00	36.7	12.7	55.8
292.50	46.9	12.6	65.7
315.00	40.7	13.0	60.2
337.50	40.1	13.3	60.0

APPENDIX A

WIND DEFINITION

WIND DEFINITION

Definition of the wind climate in Boston is complicated by the complex coastal geometry which can cause atmospheric stability effects to be significant for a wide range of wind speeds. Two types of stability can affect the winds: 1) stably stratified winds where the ground or water surface is cooler than the overlying air mass and 2) unstably stratified winds where the ground or water surface is warmer than the overlying air mass. Stability effects can effectively change the distribution of velocity with height above the surface. The coastal site can also influence wind climatology through temperature differences between land and water. These temperature differences can induce winds locally near the coast which are not closely associated with larger (synoptic or meso) scale atmospheric motions driving the general atmospheric circulations and weather patterns. All of these thermally induced effects are most influential for the lower speed winds which are significant for pedestrian comfort applications. These effects become insignificant for the extreme wind events which the building frame and cladding are designed to resist. Turbulent mixing at high wind speeds destroys the thermal gradients within the atmospheric boundary layer.

Location of National Weather Service anemometers at Logan International Airport provides a good source of wind data which is in an open area away from significant influence of buildings but close enough to the City of Boston to have winds representative of the City. The airport has three basic sources of wind data: 1) hourly data from an anemometer at 22 feet above ground which provides representation data set for pedestrian level winds, 2) fastest mile data from an anemometer which varied in elevation from 22 feet to 62 feet in elevation

which provides low probability event data not present in the hourly data at 22 feet, and 3) pilot baloon wind profile data which provides information primarily on winds at the top of the atmospheric boundary layer.

An analysis of the surface winds was made to determine the consistency of the hourly and fastest mile wind data and to determine its applicability for use for pedestrian wind analysis and structural loading. Figure A.1 shows the results of that analysis. The data points are the cumulative distribution of winds by direction (open circles) and individual fastest mile wind events (solid circles). The hourly data were translated to a gradient height of 900 feet with a 0.16 power law exponent. The fastest mile wind data was converted to an equivalent hourly wind using gust factors [A1] and translated to a gradient height of 900 feet with a 0.16 power law. Thus, both sets of data were brought to a common time average and elevation. In actuality, the hourly data are not true hourly averages but are minute data obtained once an hour, on the hour. The best estimate of the hourly mean from those samples is the sample value although some samples will obviously be too high or low. A method to correct these data to something approximating true hourly means is in research stages by the authors, but was not incorporated here due to the stability effects noted in the data.

The fastest mile events shown in Figure A.1 were established by obtaining the highest, fastest mile for each of 8 wind directions for 42 years of record from the National Climatic Center, Asheville, North Carolina. The 336 resulting values corrected to hourly mean at gradient level, were ordered from highest to lowest and assigned

probabilities of

$$P_i = \frac{i}{N + 1}$$

where i is the order number of the sample and N = 367,920, the total number of hours in the 42 year record. By using only the 95 largest values, the resulting velocity/probability combinations should reasonably represent the low probability events. The data plotted in Figure A.1 show that the fastest mile data form a continuous curve with the hourly data. Since fastest mile data was only available at 8 wind directions, the values at intermediate directions were interpolated.

The probabilistic model fit to the data and shown on Figure 1 was, for each wind direction, a Weibull

$$P\ (>U) = A_e^{-\left[\frac{u}{c}\right]^k}$$

where A, c and k are constants. The value of A represents the fraction of time the wind blows from each of the 16 directions considered and was obtained from the published distribution of hourly data. The sum of A's from all wind directions was required to equal 1.0, a necessary condition for a consistent probability definition. The values of c and k were obtained by least squares fit.

Examination of Figure A.1 shows that the data points do not follow precisely a straight line but have a definite curvature. This same curvature has been identified by Rijkoort [A2] to be due to atmospheric stability effects.

Because of the significant stability effects noted in the data, it is more accurate to use the surface wind data (22 feet) for pedestrian winds than to use gradient level winds. For the pedestrian wind analysis, the basic data was used with linear interpolation between data points, rathr than the analytical fit to be sure that all characteristics of the probability distribution were properly included. This data appears in Table A.1. The translation of the data to gradient level did not distort the probability distribution since the translation used the same neutral boundary layer characteristics which were used in the wind tunnel model.

TABLE A1

PERCENTAGE FREQUENCY OF WIND DIRECTION AND SPEED

GENERAL LOGAN INTERNATIONAL AIRPORT (1965-1974)

SEASON : ANNUAL NO. OF OBS.= 29206 HT. OF MEAS.= 22. FT.

VELOCITY LEVELS IN MPH

DIRECTION	0- 3	4- 7	8-12	13-18	19-24	25-31	32-38	39-46	47 +	TOTAL
N	.30	1.40	3.00	2.20	.40	.10	.04	0.00	0.00	7.44
NNE	.20	.80	.90	.70	.20	.10	0.00	0.00	0.00	2.90
NE	.20	.50	1.10	1.00	.30	.20	0.00	0.00	0.00	3.30
ENE	.10	.70	1.20	1.10	.30	.10	0.00	0.00	0.00	3.50
E	.30	1.00	2.40	2.30	.30	.10	.02	0.00	0.00	6.42
ESE	.30	.90	1.90	1.90	.30	0.00	.02	0.00	0.00	5.32
SE	.20	1.00	1.60	.60	0.00	0.00	0.00	0.00	0.00	3.40
SSE	.20	.80	1.10	.40	0.00	0.00	0.00	0.00	0.00	2.50
S	.30	1.60	3.00	1.80	.20	.10	.02	0.00	0.00	7.02
SSW	.10	.70	2.00	2.40	.60	.10	0.00	0.00	0.00	5.90
SW	.10	.80	1.90	2.70	.60	.10	0.00	0.00	0.00	6.20
WSW	.10	1.10	3.30	3.90	.70	.10	.04	0.00	0.00	9.24
W	.20	.90	2.70	5.00	1.50	.50	.10	.05	0.00	10.95
WNW	.10	.70	2.70	4.70	1.60	.50	.10	.05	0.00	10.45
NW	.10	.80	3.10	4.10	1.10	.30	.06	0.00	0.00	9.56
NNW	.10	.70	2.20	2.20	.40	0.00	0.00	0.00	0.00	5.60
CALM	.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.30
TOT	3.30	14.30	34.20	36.90	8.50	2.30	.40	.10	0.00	100.00

PROJECT 5820

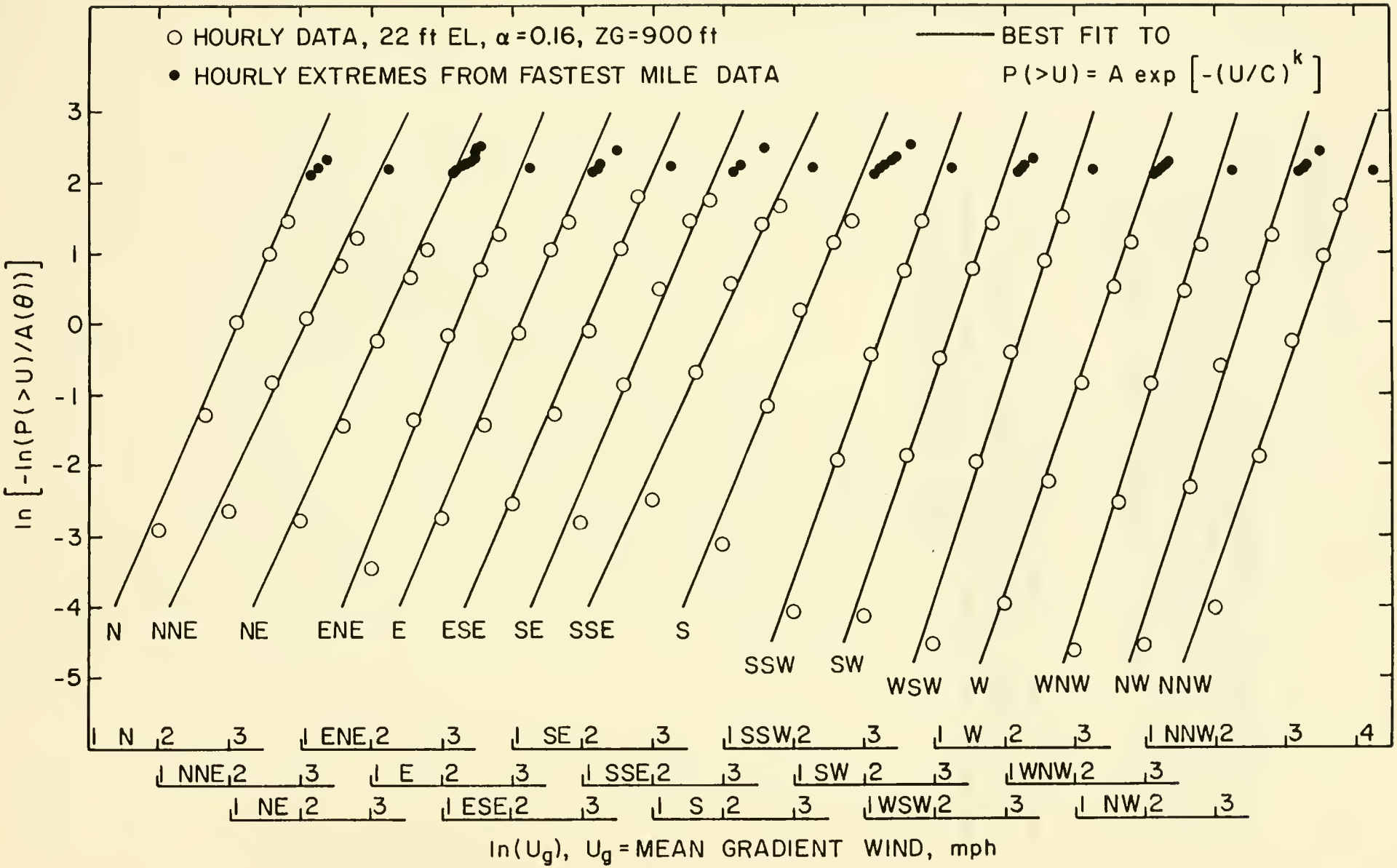


Figure A1. Wind Speeds in Boston by Direction

REFERENCES

A1. Hollister, S.C., "The Engineering Interpretation of Weather Bureau Records for Wind Loading on Structures," Building Science Series 30-Wind Loads on Buildings and Structures, National Bureau of Standards, 1970, pp. 151-164.

A2. Rijkoort, P.J., "A Compound Weibull Model for the Description of Surface Wind Velocity Distributions," Scientific Report W.R. 83-13, Koninklijk Nederlands Meteorlogisch Instituut, 1983.

APPENDIX B

EXPERIMENTAL MEASUREMENTS

EXPERIMENTAL MEASUREMENTS

Wind velocity measurements were performed in the environmental wind tunnel at Colorado State University (Figure B.1). The same wind tunnel was used during the Part 1 flow visualization study.

Vertical profiles of mean velocity and logintudinal turbulence intensity were measured upstream of the model to determine that an approach boundary layer flow appropriate to the site had been established. Approach profiles were specified the Pedestrian Flow Visualization Study. Profiles were also obtained at the building site with the building removed to show the influences of surrounding buildings.

In addition, mean veloity and turbulence intensity measurements were made 5 to 7 feet (full-scale) above the surface at each of the pedestrian locations for 16 wind directions. The measurement locations are shown in Figures 1 though 3. The surface measurements indicate the wind environment to which a pedestrian at the measurement location would be subjected. The locations were chosen to determine the pedestrian environment on and near the project site prior to and after construction and at selected locations away from the project site.

Measurements were made with a single hot-film anemometer which was mounted with its axis vertical. The instrumentation used was a TSI, Inc. constant temperature anemometer (Model 1050) with a 0.002 inch diameter platinum film sensing element. Output was directed to the on-line data acquisition system for analysis.

Calibration of the hot-film anemometer was performed by comparing output with the reference Pitot-static probe in the wind tunnel. The calibration data were fit to a

variable exponent King's law relationship of the form

$$E^2 = A + BV^C$$

where E is the hot-film output voltage, V the velocity and A, B and C are coefficients selected to fit the data. The above relationship was used to determine the mean velocity at measurement points using the measured mean voltage. The fluctuating velocity in the form V_{rms} (root-mean-square velocity) was obtained from

$$V_{rms} = \frac{2\ E\ E_{rms}}{B\ C\ V^{c-1}}$$

where E_{rms} is the root-mean-square (about the mean) voltage output from the anemometer. For interpretation, all turbulence measurements for pedestrian winds were divided by the mean velocity V_{inf} at 900 feet near the edge of the atmospheric boundary layer. Turbulence intensity in velocity profile measurements used the local mean velocity.

Mean velocity and turbulence intensity profiles for the boundary layer flow approaching the modeled area has the form

$$\frac{V}{V_{inf}} = \left[\frac{z}{z_{inf}}\right]^n$$

in which V is the mean velocity at height z, V_{inf} is a reference wind speed at reference height z_{inf} at which the Pitot-static probe was mounted in the wind tunnel, and n is a constant which depends on the characteristics of the upstream roughness.

Three different approach profiles were to be used in the study. Those target profiles and the actual profiles obtained in the wind tunnel were:

Profile	Wind Directions	Power Law Exponent, n Target	Power Law Exponent, n Wind Tunnel	Gradient Height
a)	25-125°	0.16	0.17	900
b)	125-215°	0.23	0.23	1200
c)	215-360°,0-25°	0.30	0.29	1400

Measured profiles of longitudinal turbulence intensity in the flow approaching the modeled area and at the building site are shown in Figures B1 through B2. The three velocity profiles are close to those selected for the Pedestrian Flow Visualization Study. The turbulence intensities are appropriate for the approach mean velocity profiles selcted. For the velocity profiles, turbulence intensity is defined as the root-mean-square about the mean of the longitudinal velocity fluctuations divided by the local mean velocity U as shown

$$Tu = \frac{V_{rms}}{V}$$

Velocity data obtained at each of the pedestrian measurement locations shown in Figures 1 through 3 are listed in Table 2 as mean velocity V/V_{inf}, turbulence intensity V_{rms}/V_{inf}, and as the largest effective gust.

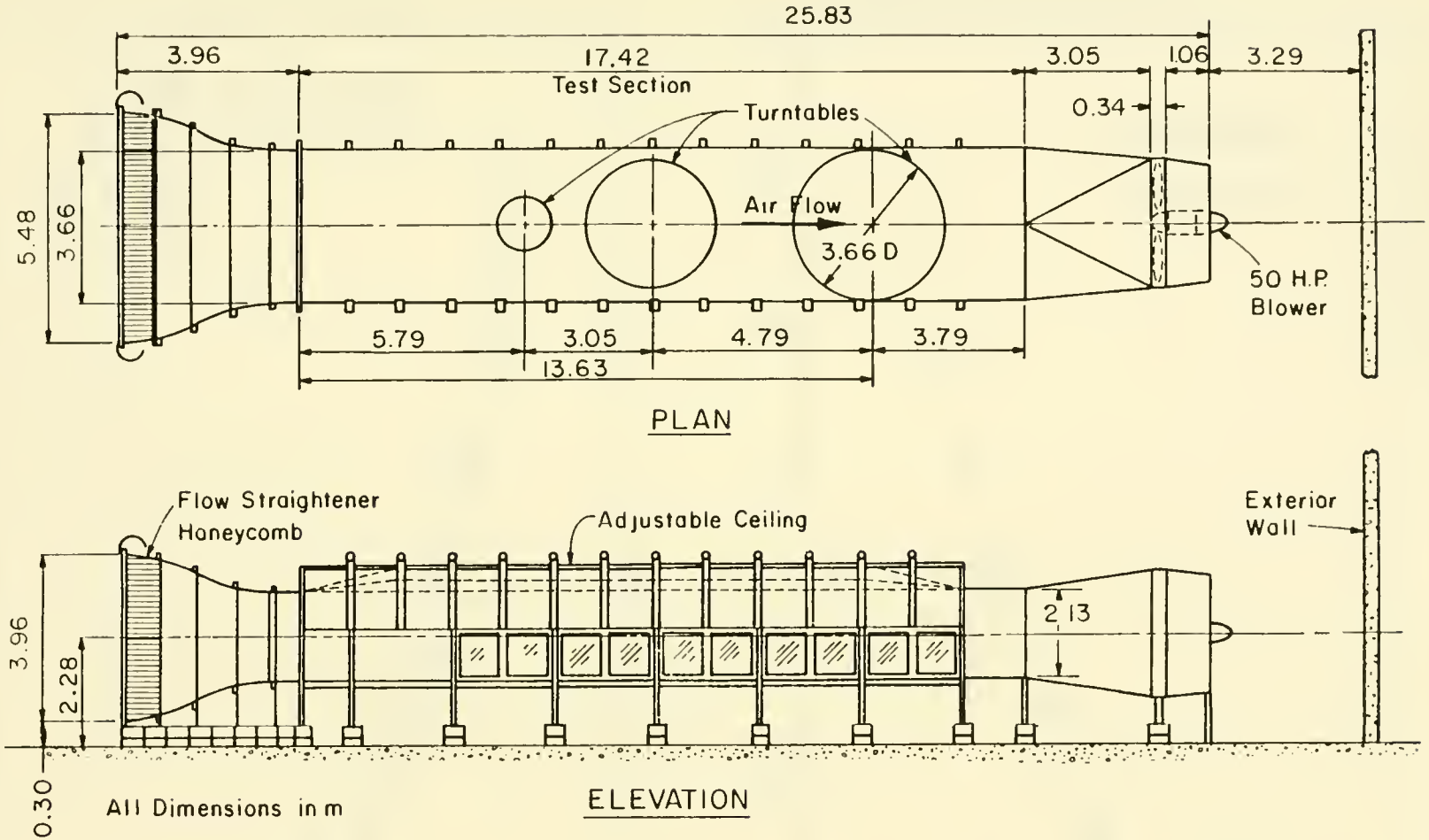
$$V_{pk} = \frac{V + 1.5V_{rms}}{V_{inf}}$$

The mean and peak velocities obtained 5 to 7 feet above ground level are plotted in polar form in Appendix C. the

graphs show velocity magnitude and the approach wind direction for which that velocity was measured.

Mean velocity percentages above about 70 percent are quite high. High mean velocities for 3 to 5 or more approach wind azimuths for one location may indicate a highly windy environment. Values of V_{rms} are of concern if they are above about 25 percent of V_{inf}--expecially if accompanied by a large mean velocity. Peak gusts, represented by $(V + 1.5\ V_{rms})V_{inf}$, in Table 1 can be considered as very large if above about 100 percent of V_R.

To enable a quantitative assessment of the wind environment, the wind-tunnel data were combined with wind frequency and direction information obtained at Logan International Airport. Table A1 shows wind frequency by direction and magnitude obtained from summaries published by the National Weather Service. See Appendix A for a discussion of this data. These data, obtained at an elevation of 22 feet, were combined statistically with the wind-tunnel data of Table 1 to obtain cumulative probability distributions of wind speed for the full-scale site at each pedestrian measurement location. The distributions are plotted in Appendix D. These curves show, for each pedestrian location, the percent of time that a given mean velocity or effective peak velocity is exceeded at that location. Because pedestrians will tolerae higher wind speeds for a smaller period of time than for lower wind speeds, these curves provide a means of evaluating the overall acceptability of a pedestrian location.



ENVIRONMENTAL WIND TUNNEL
FLUID DYNAMICS & DIFFUSION LABORATORY
COLORADO STATE UNIVERSITY

Figure B1. Wind-Tunnel Configuration

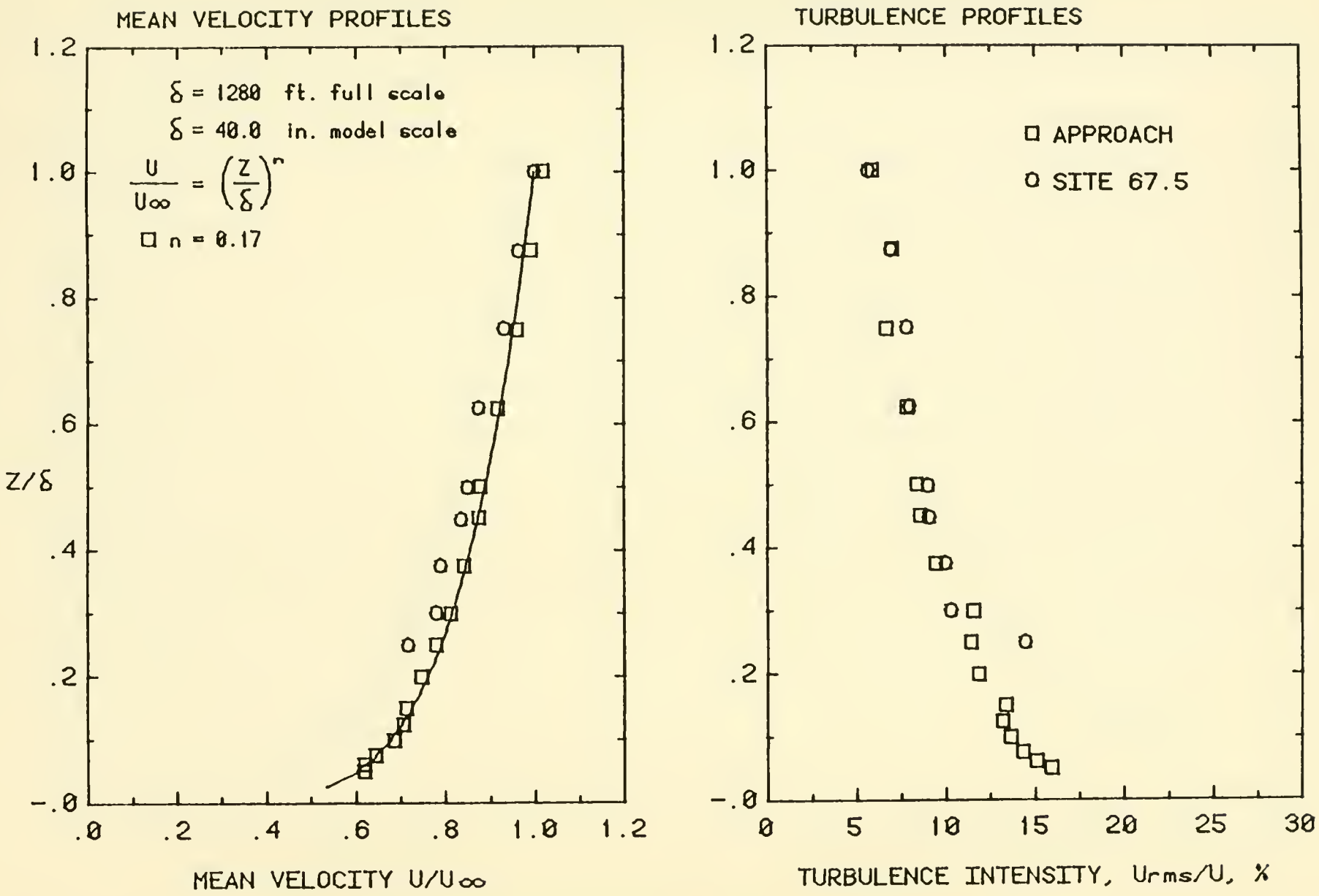


Figure B2. Approach and Site Velocity Profiles for Approach A

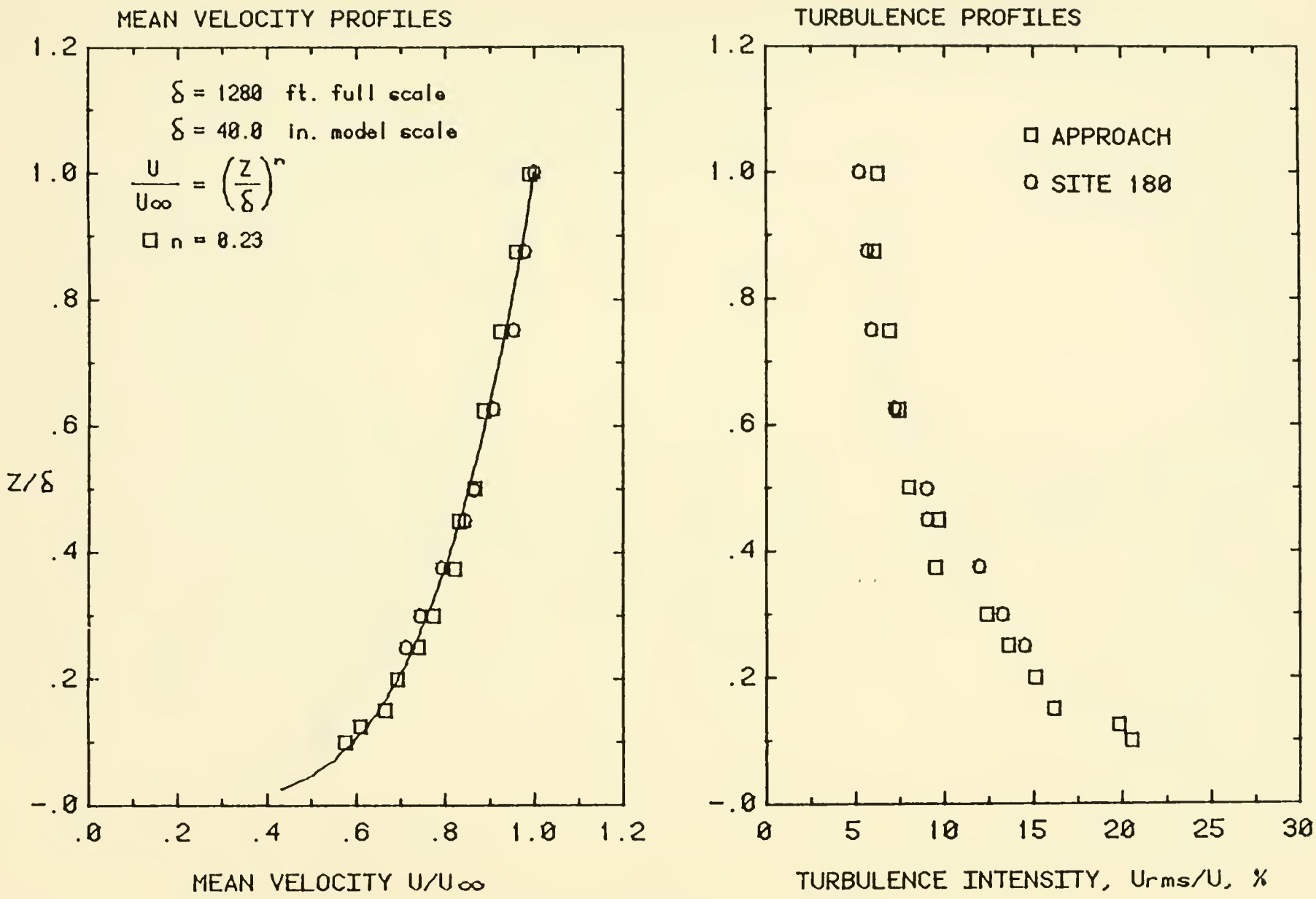


Figure B3. Approach and Site Velocity Profiles for Approach B

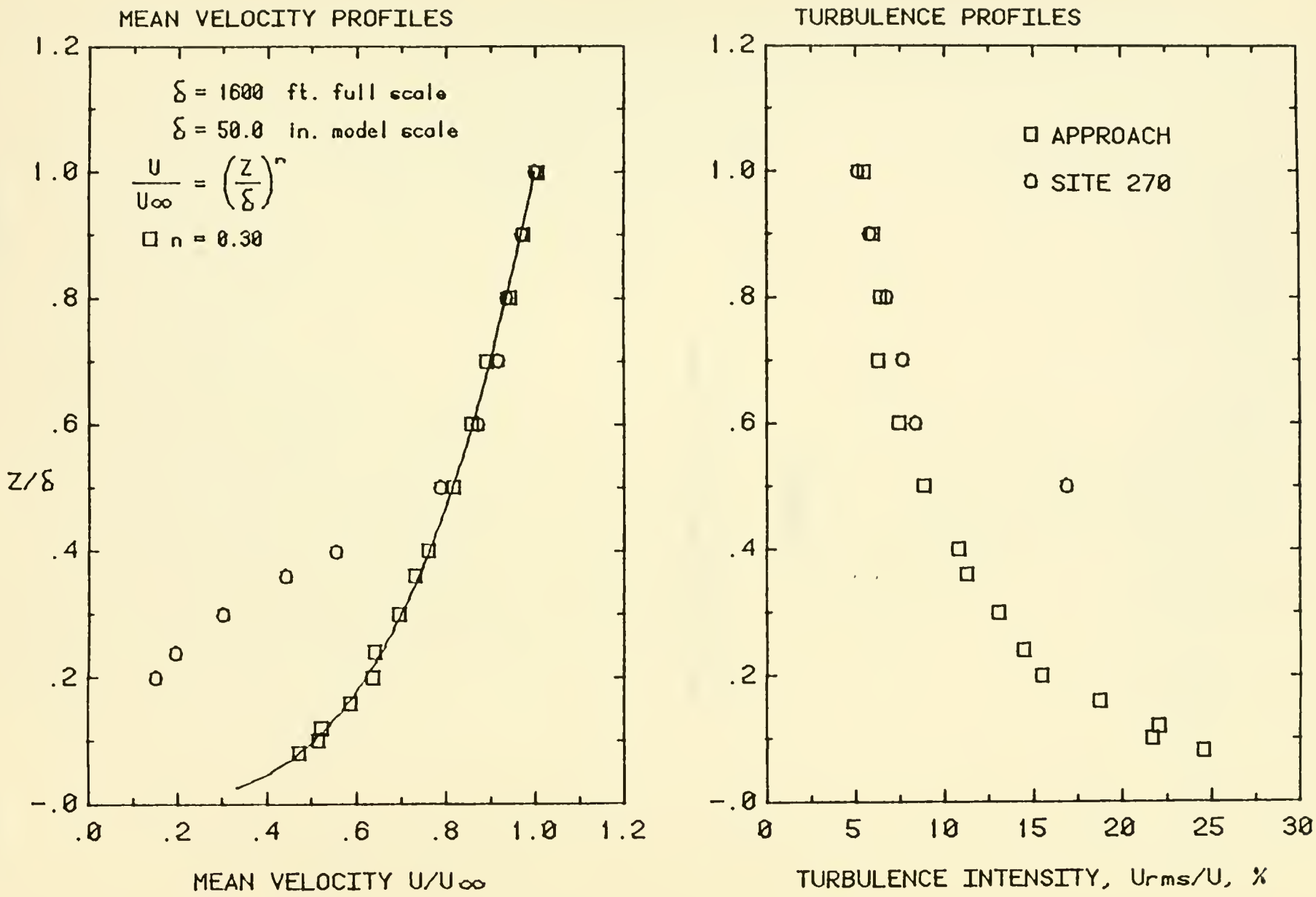


Figure B4. Approach and Site Velocity Profiles for Approach C

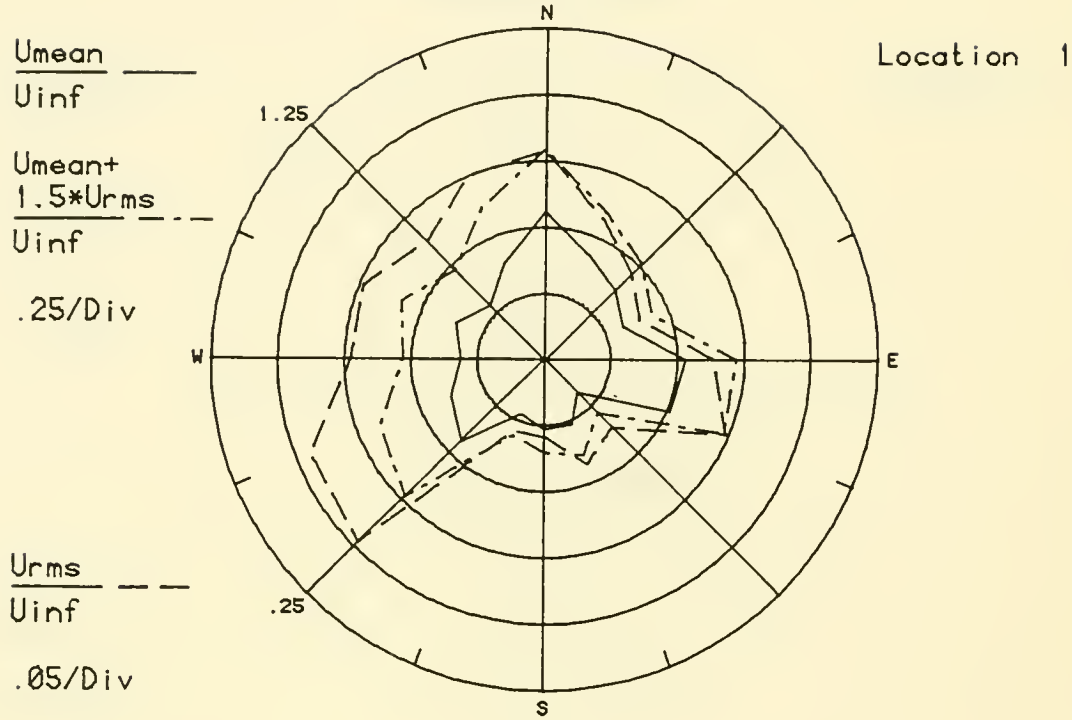
APPENDIX C

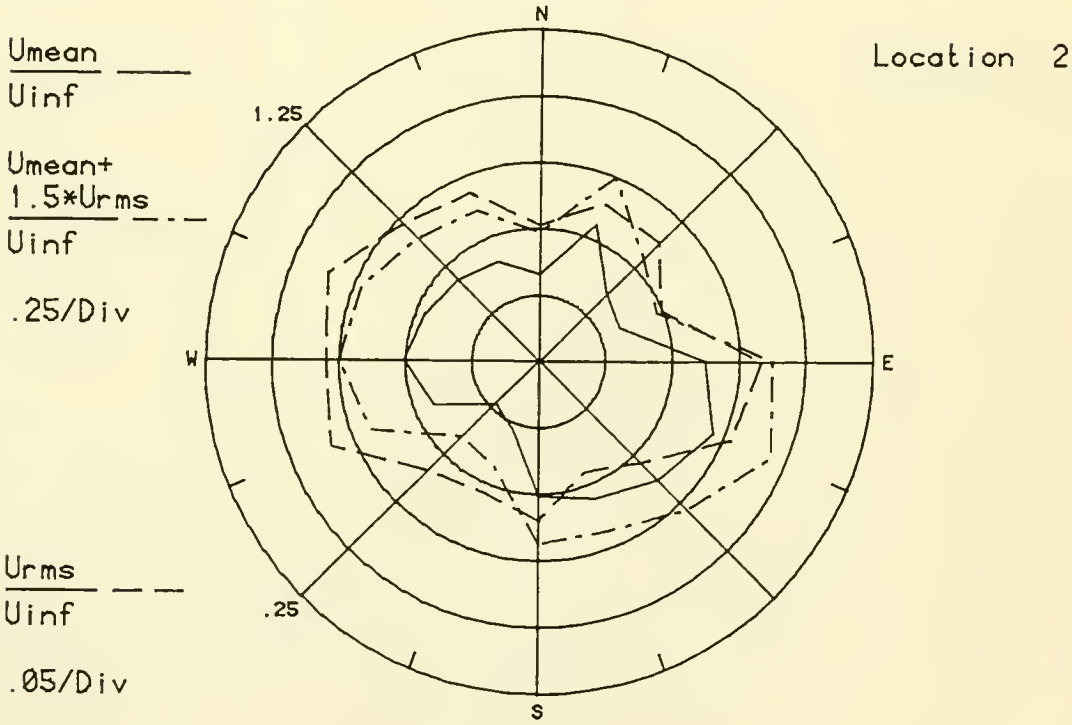
POLAR PLOTS OF PEDESTRIAN WINDS

POLAR PLOTS OF PEDESTRIAN WINDS

The graphs included in this appendix show the directional variation of measured wind speeds normalized by the wind speed at an elevation of 900 feet.

Configuration PRE





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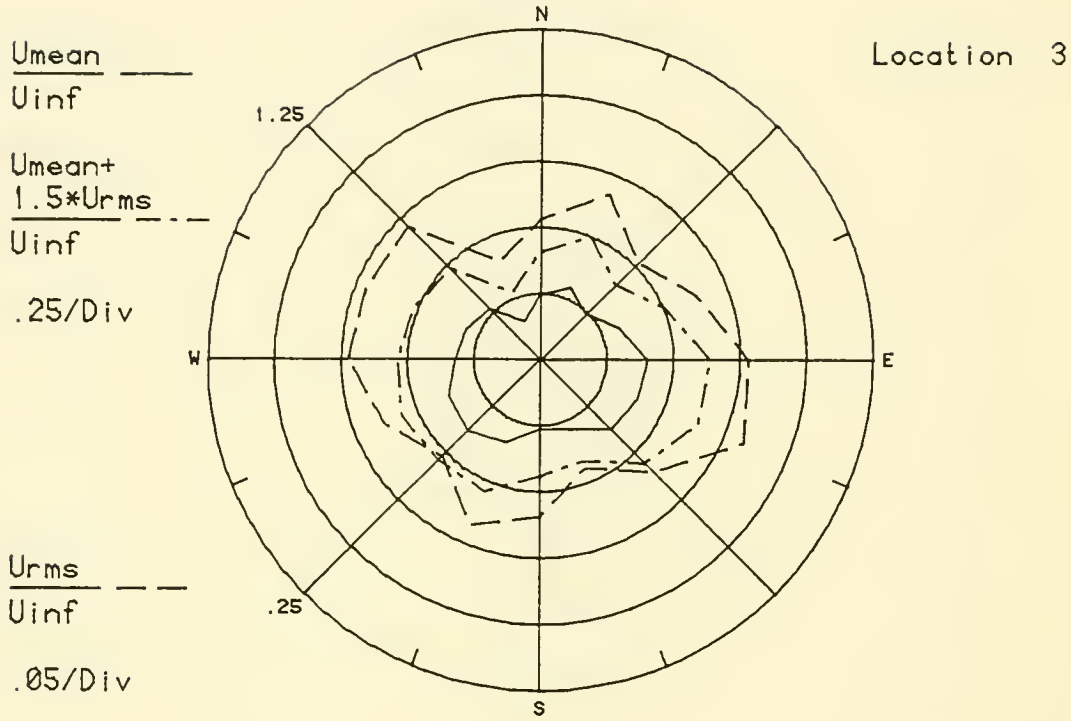

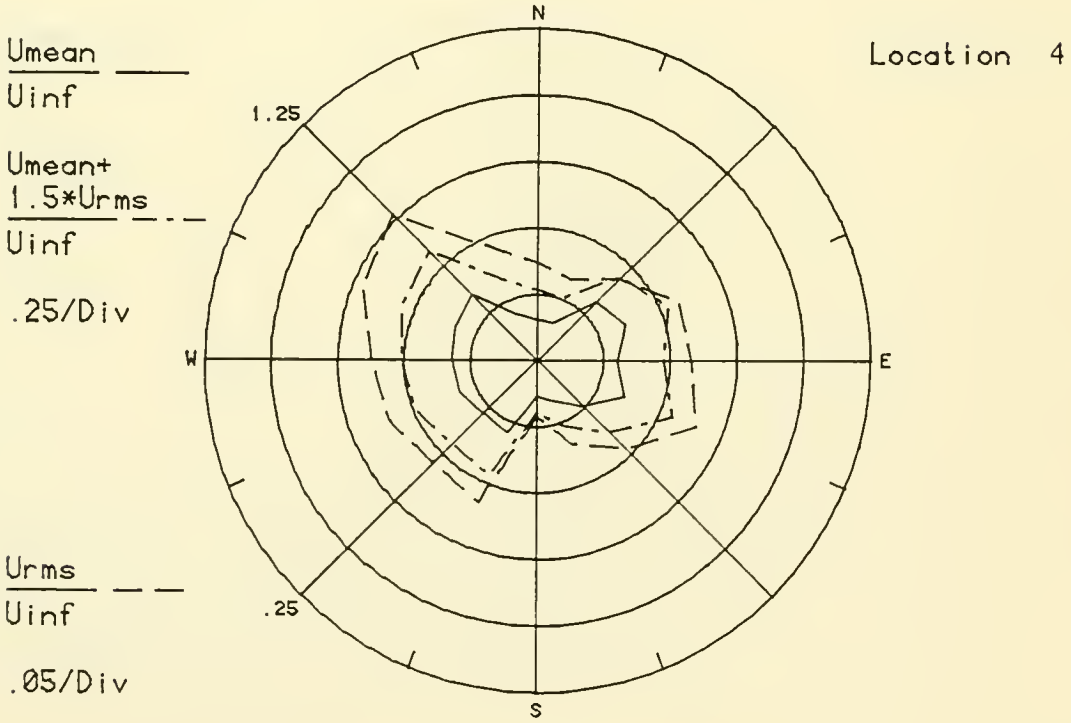

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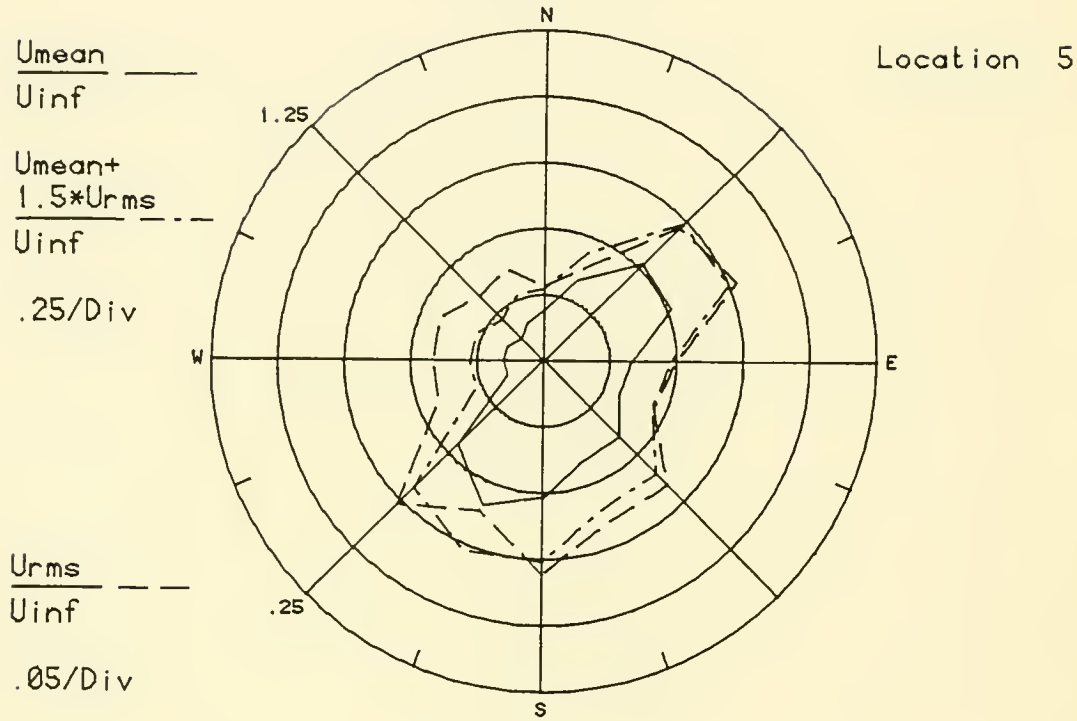

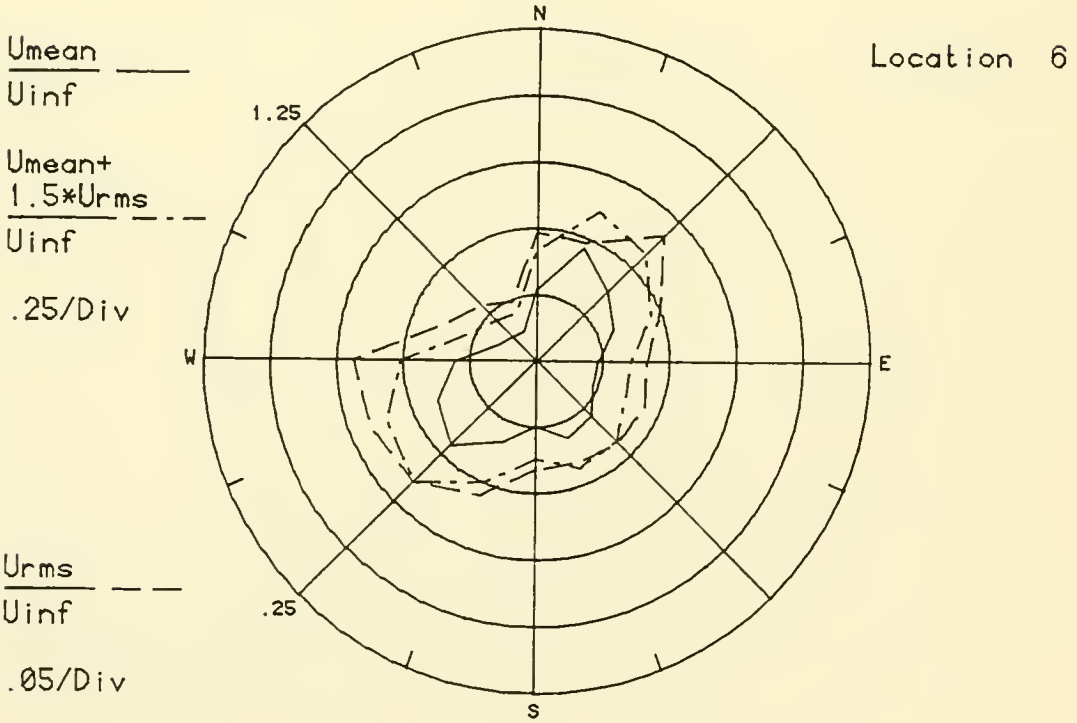

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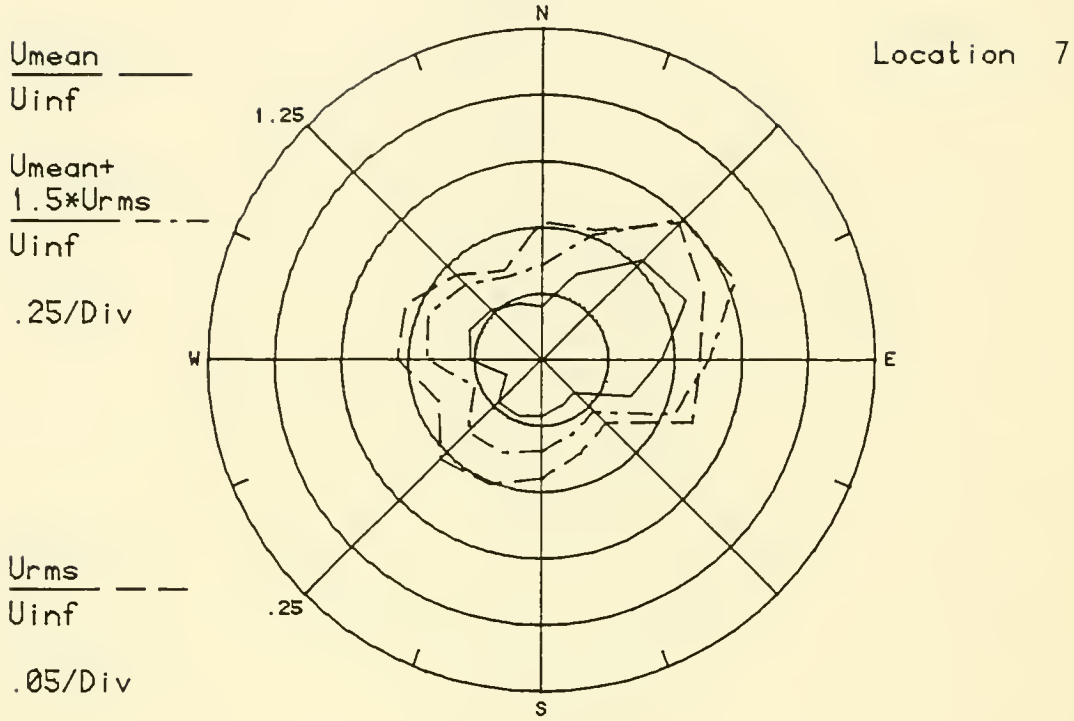

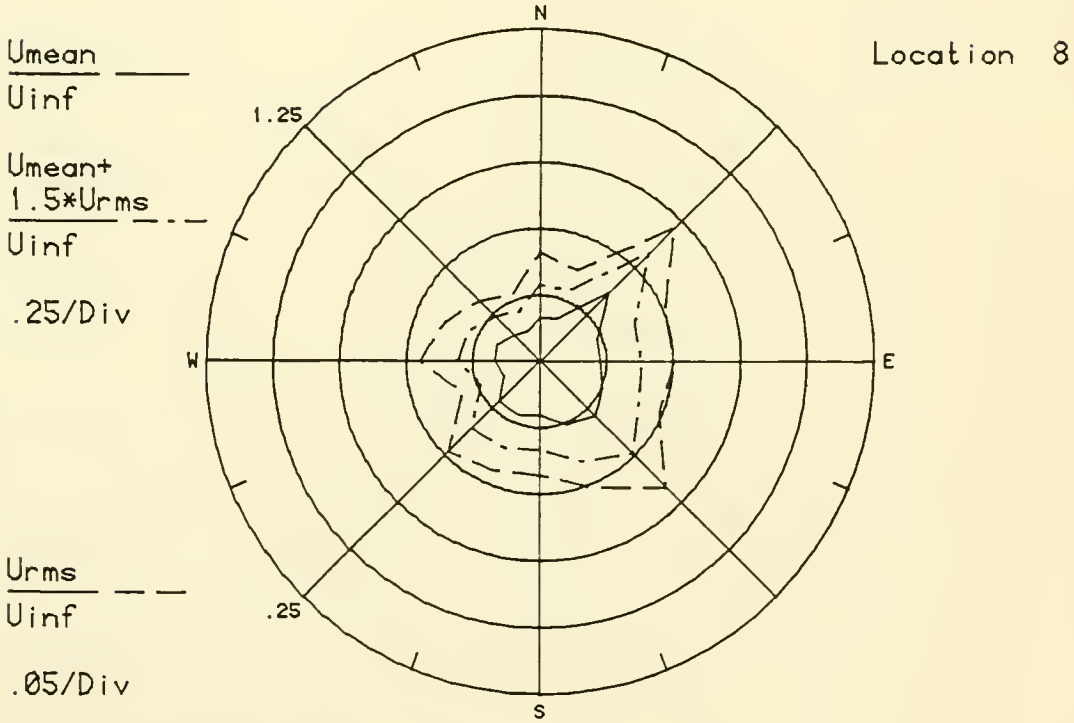

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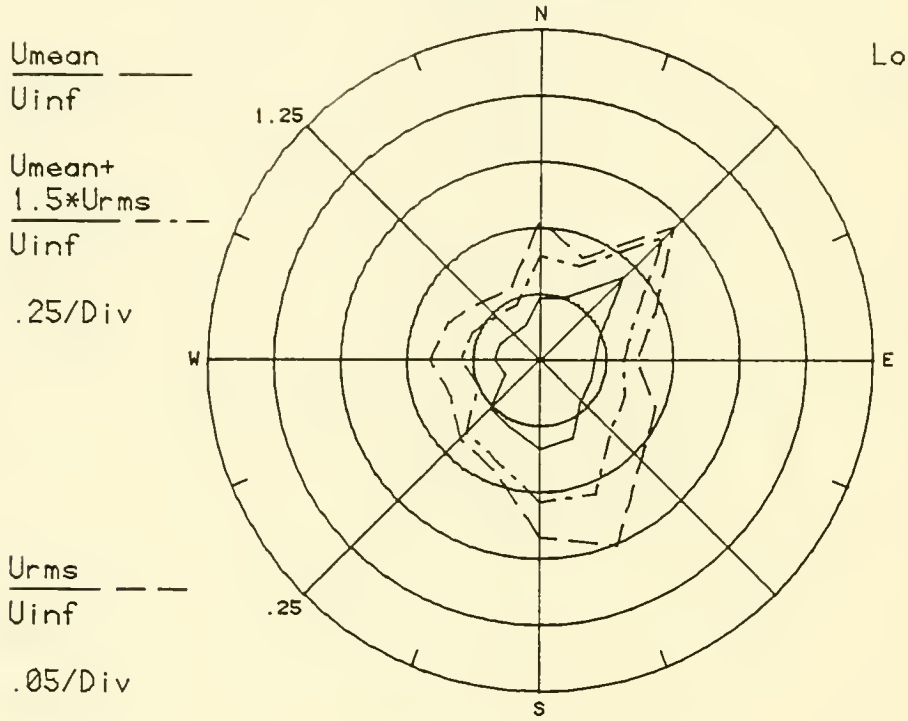

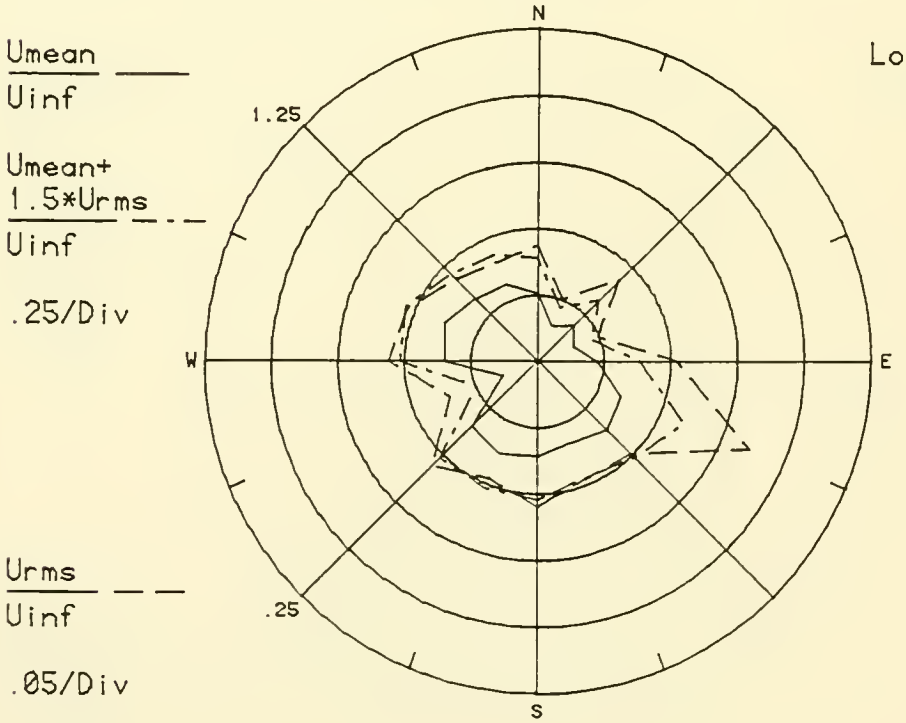

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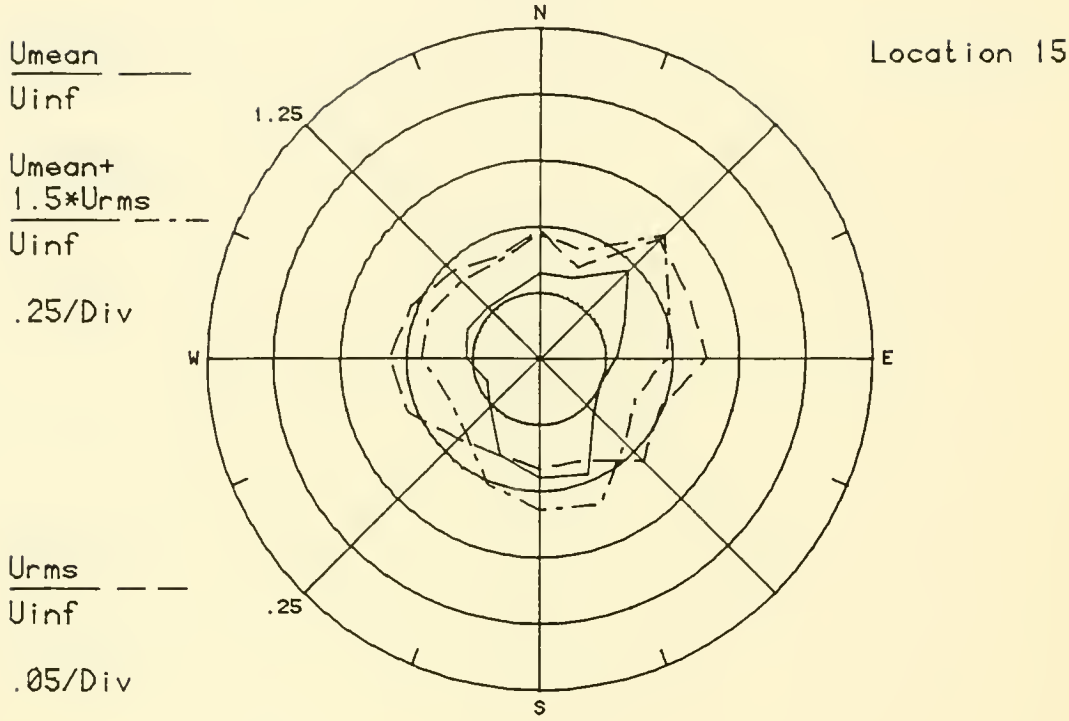

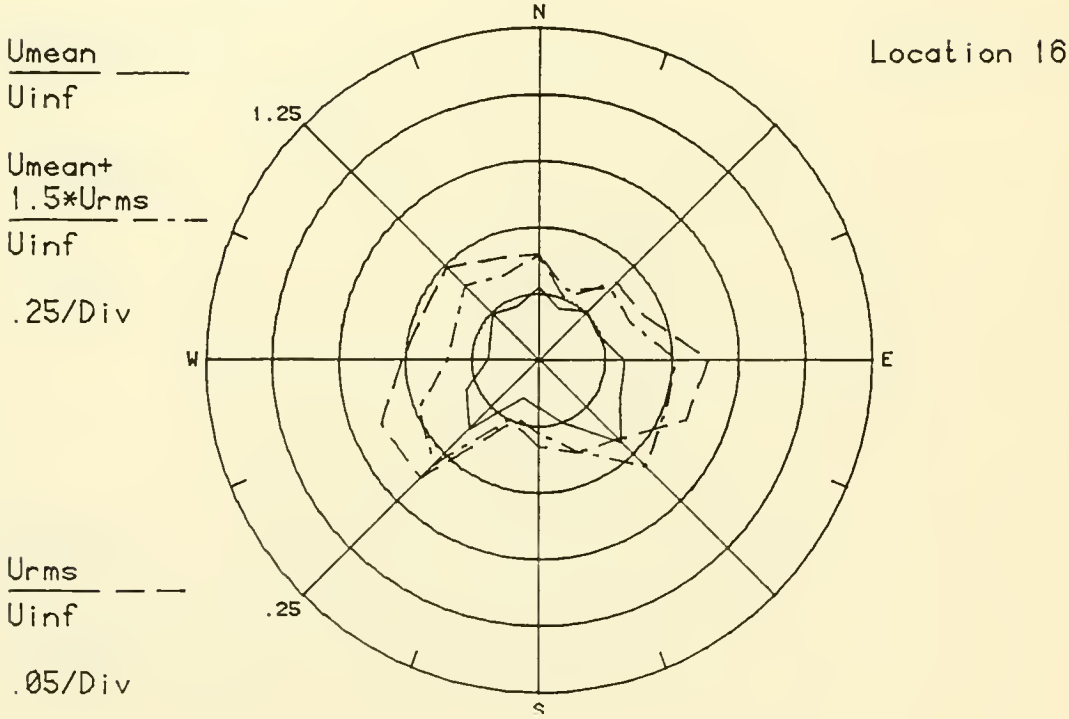

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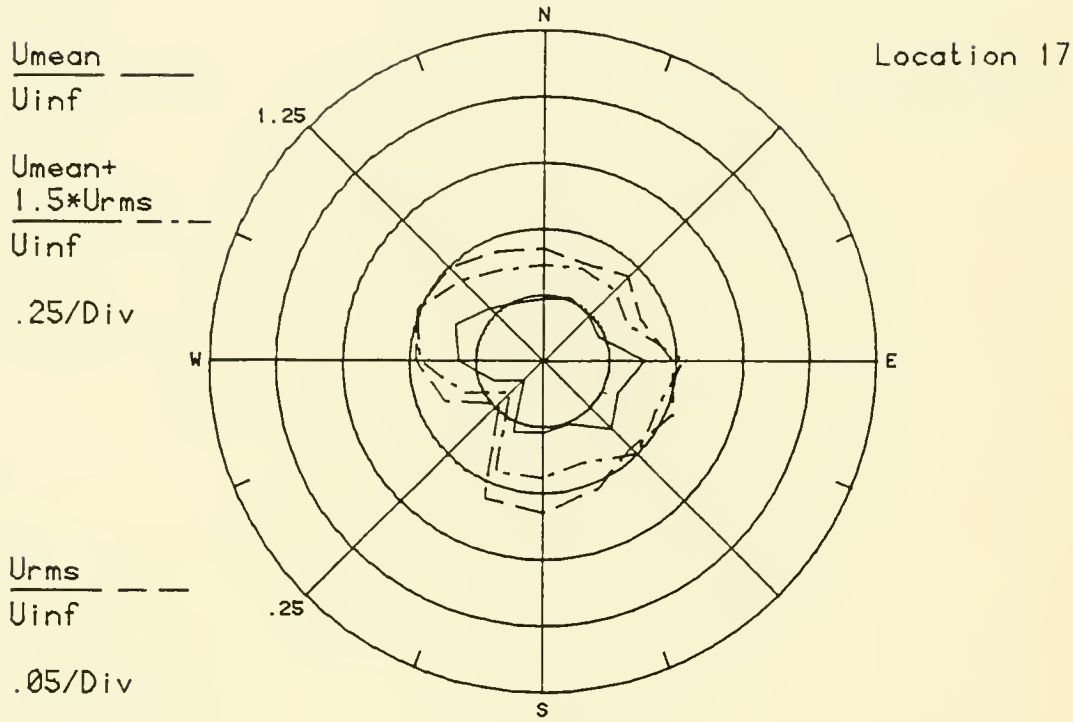

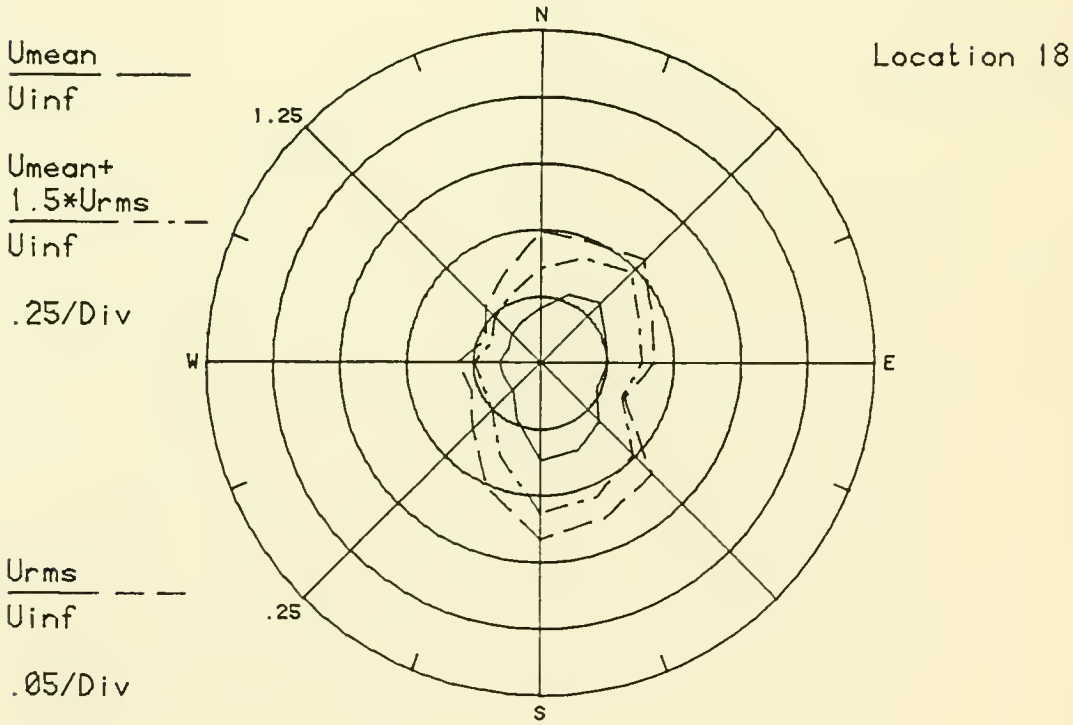

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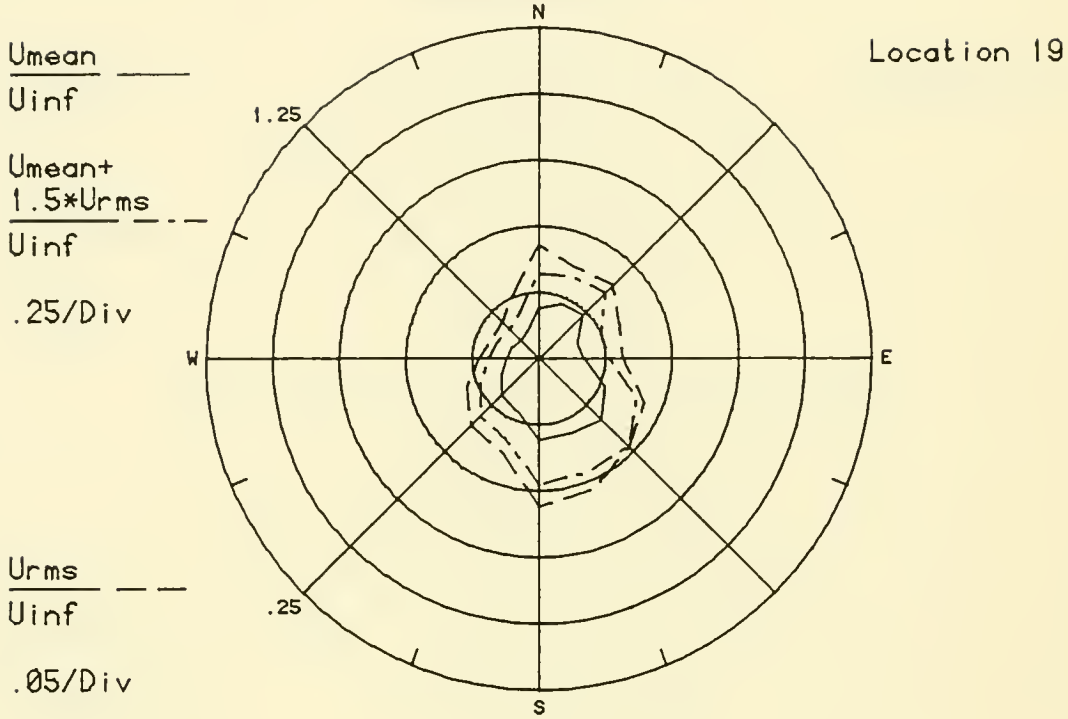

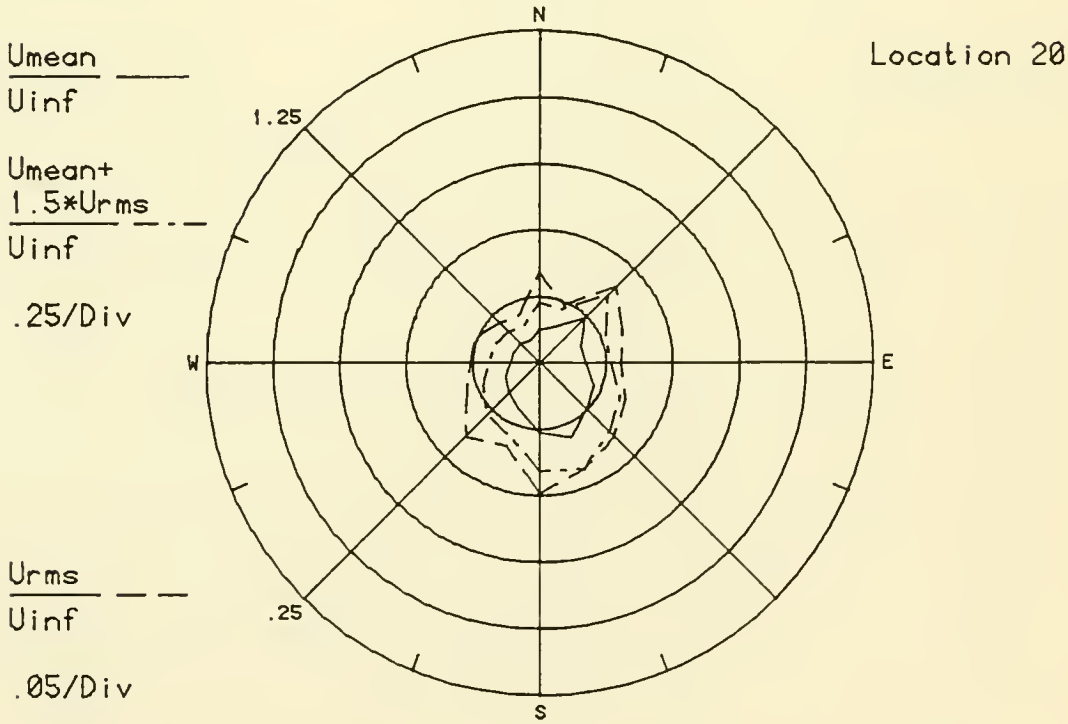

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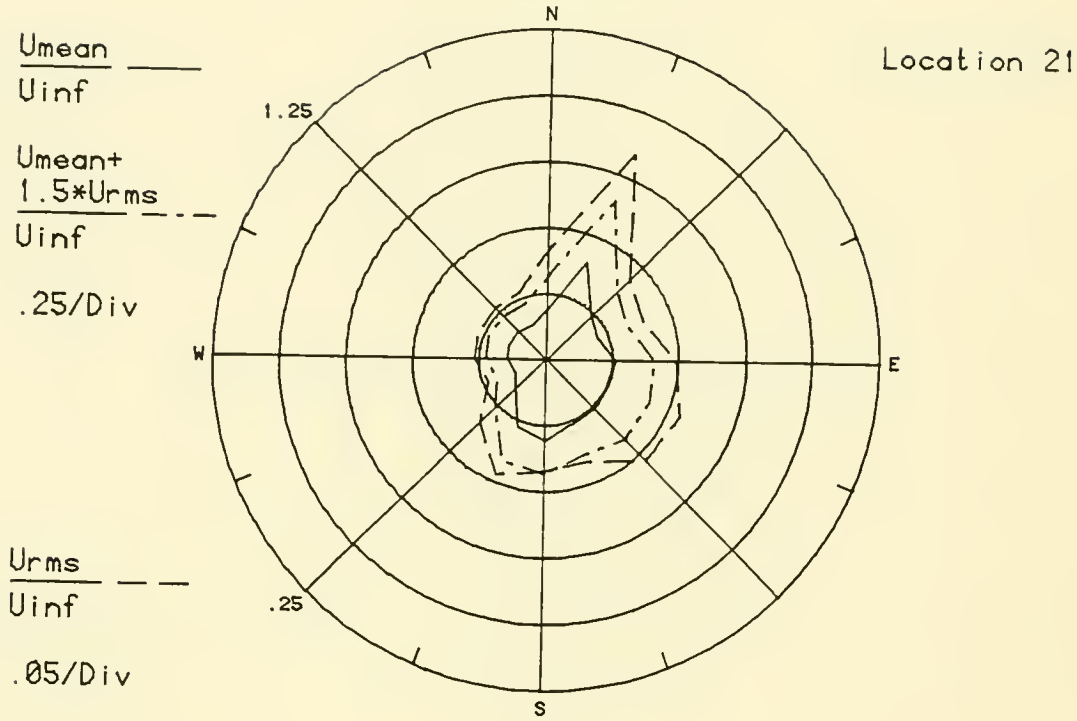

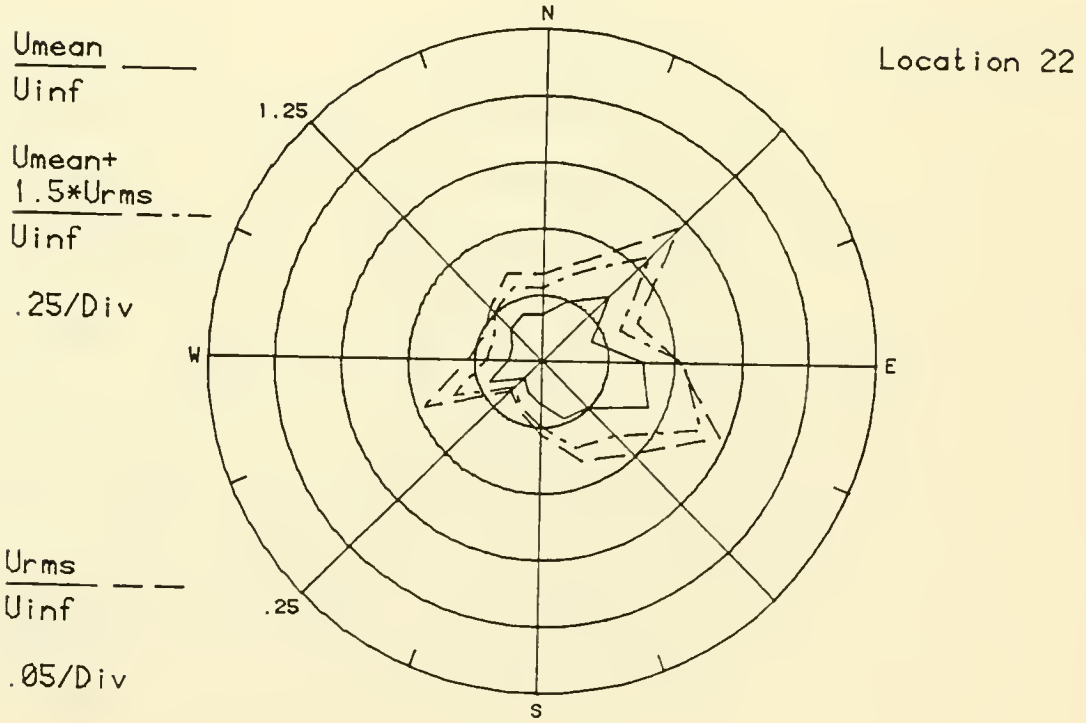

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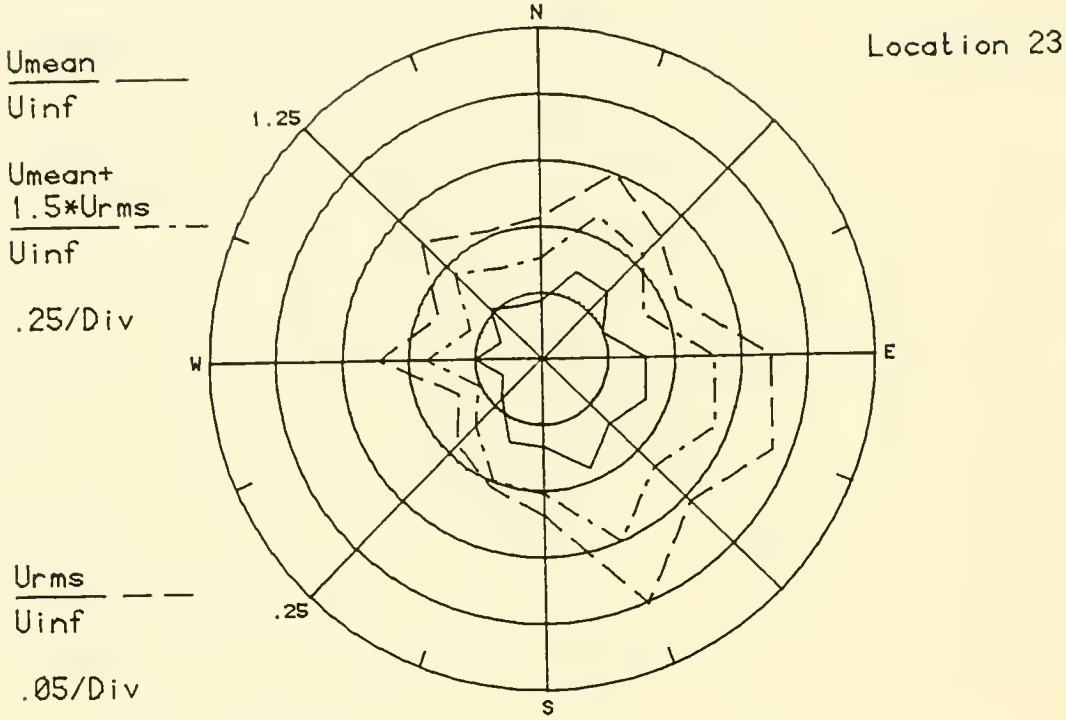

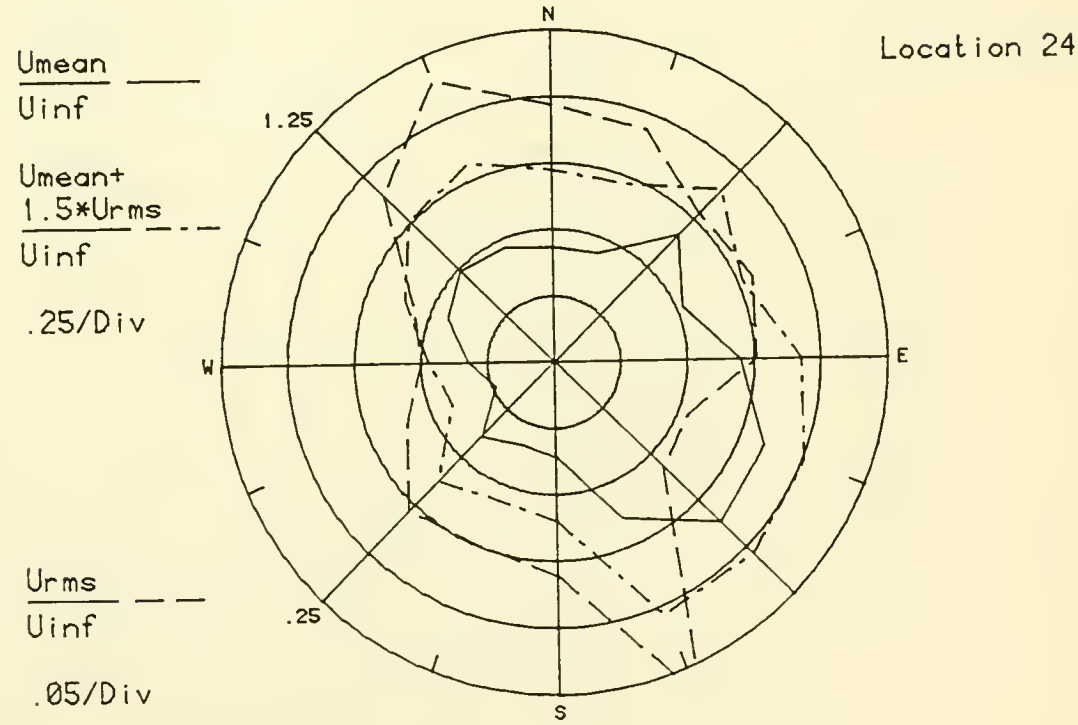

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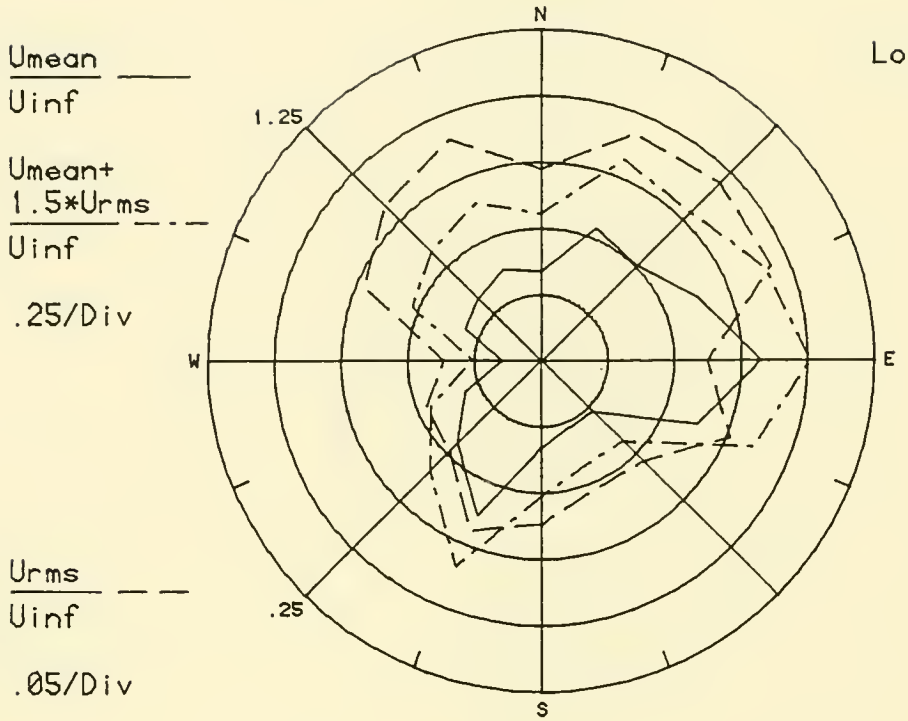

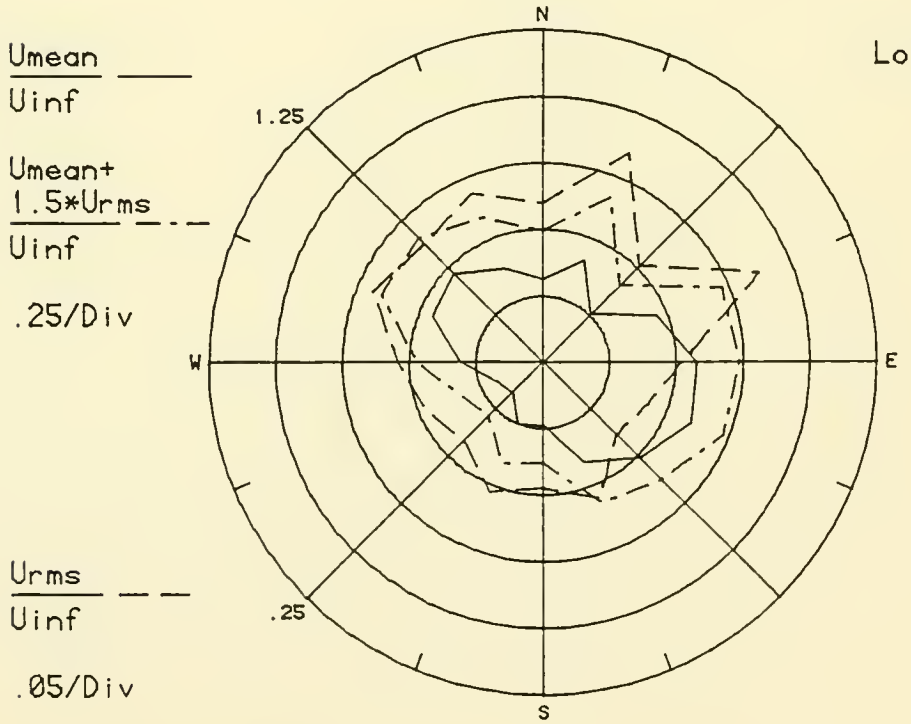

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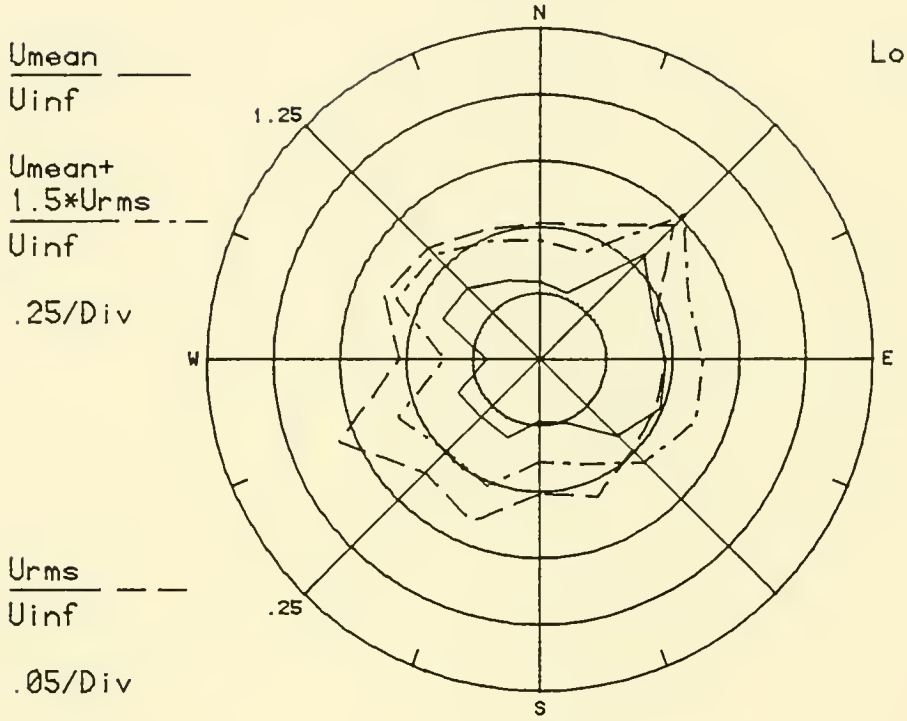

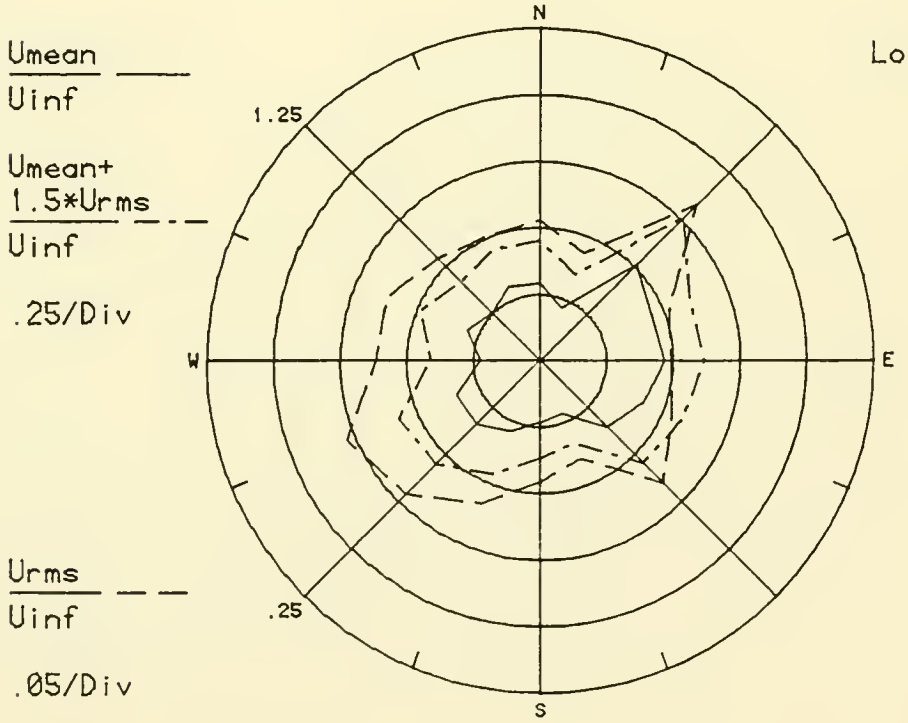

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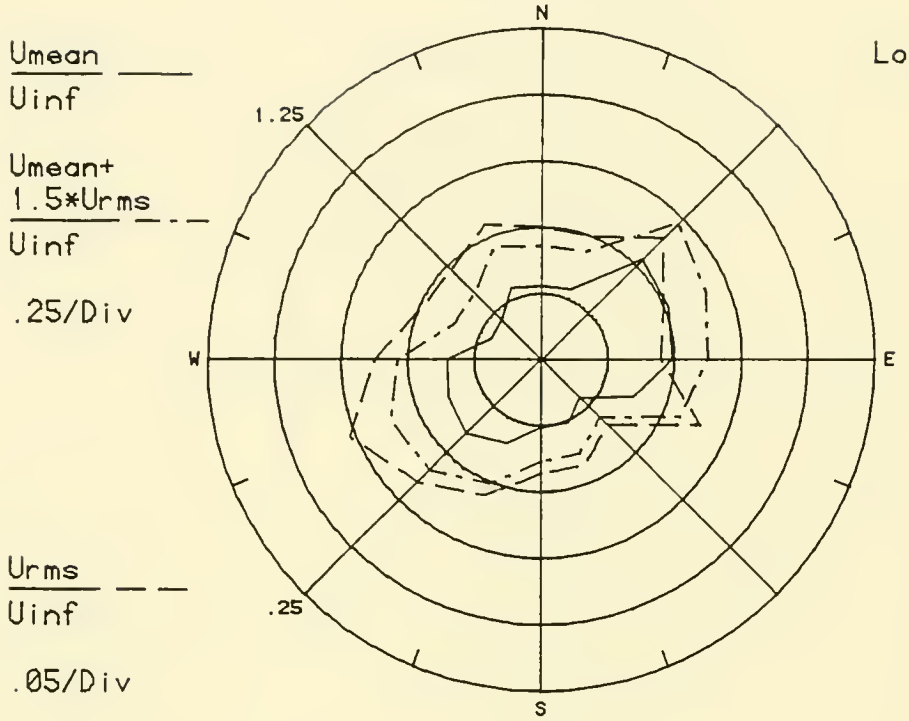

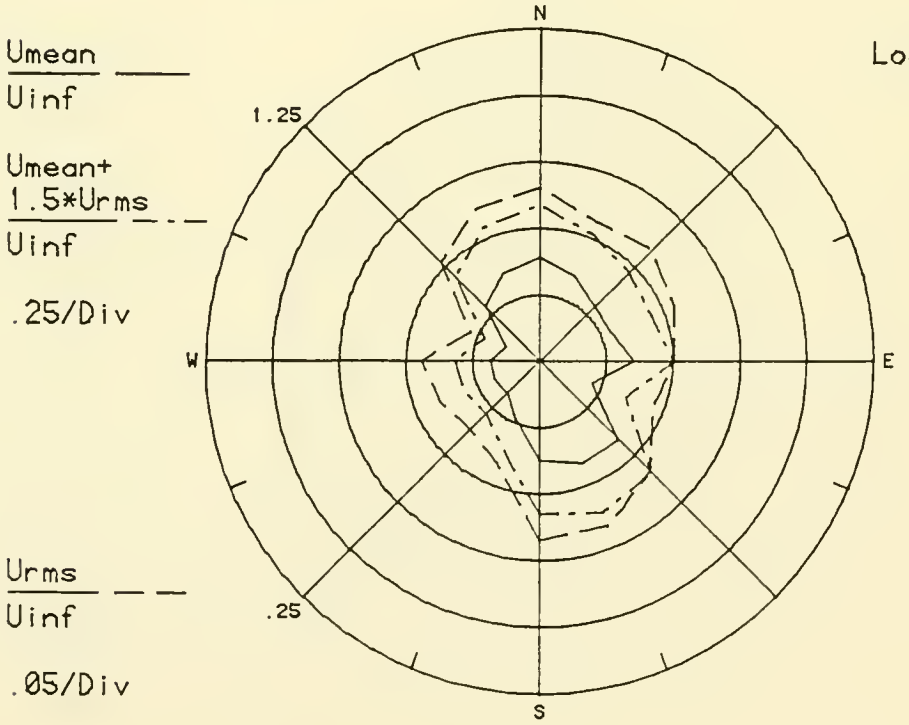

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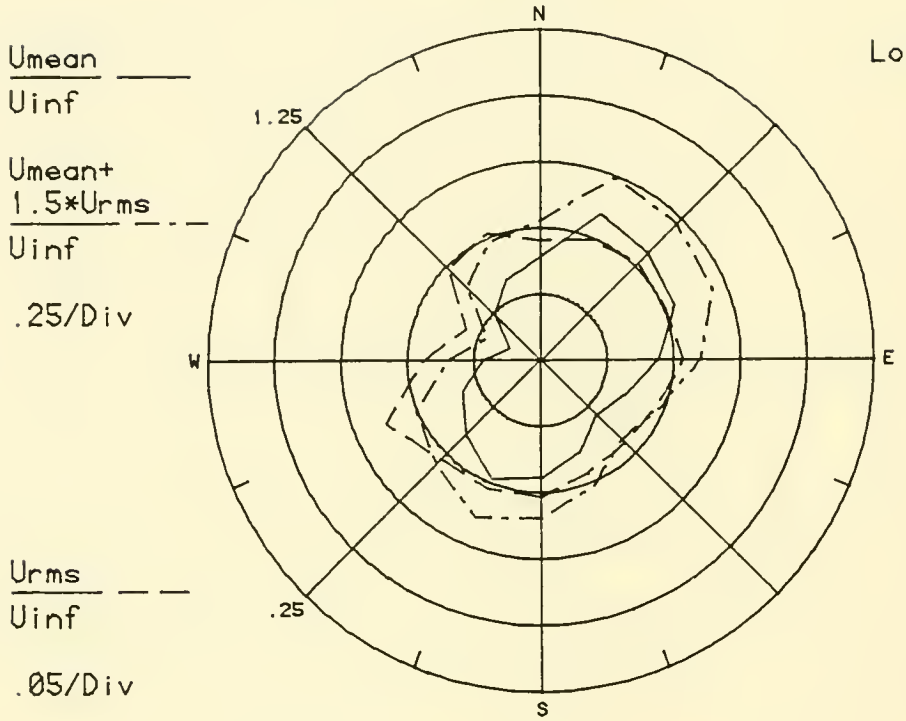

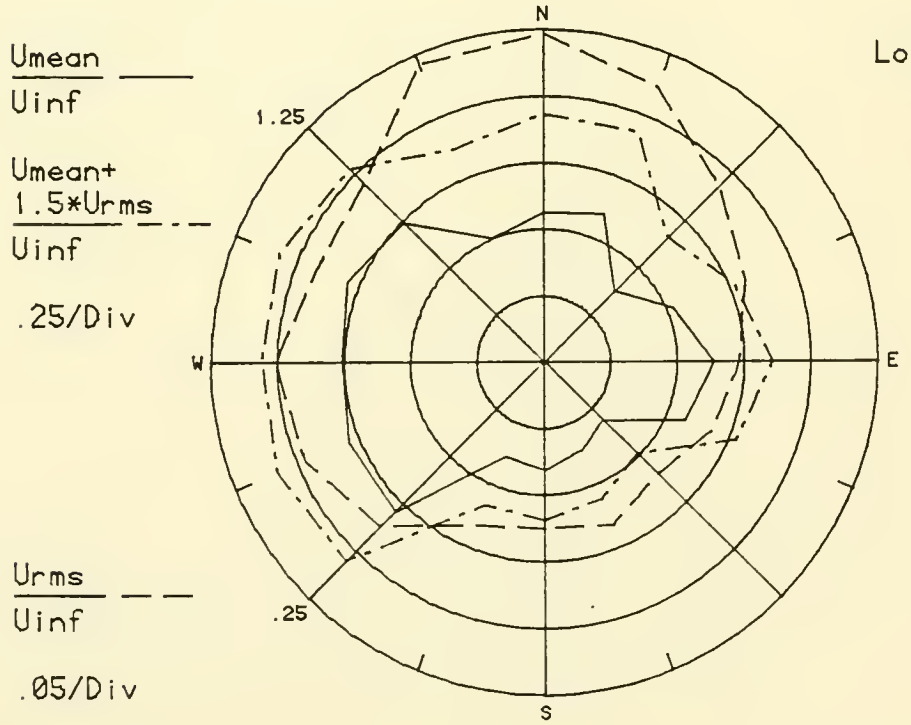

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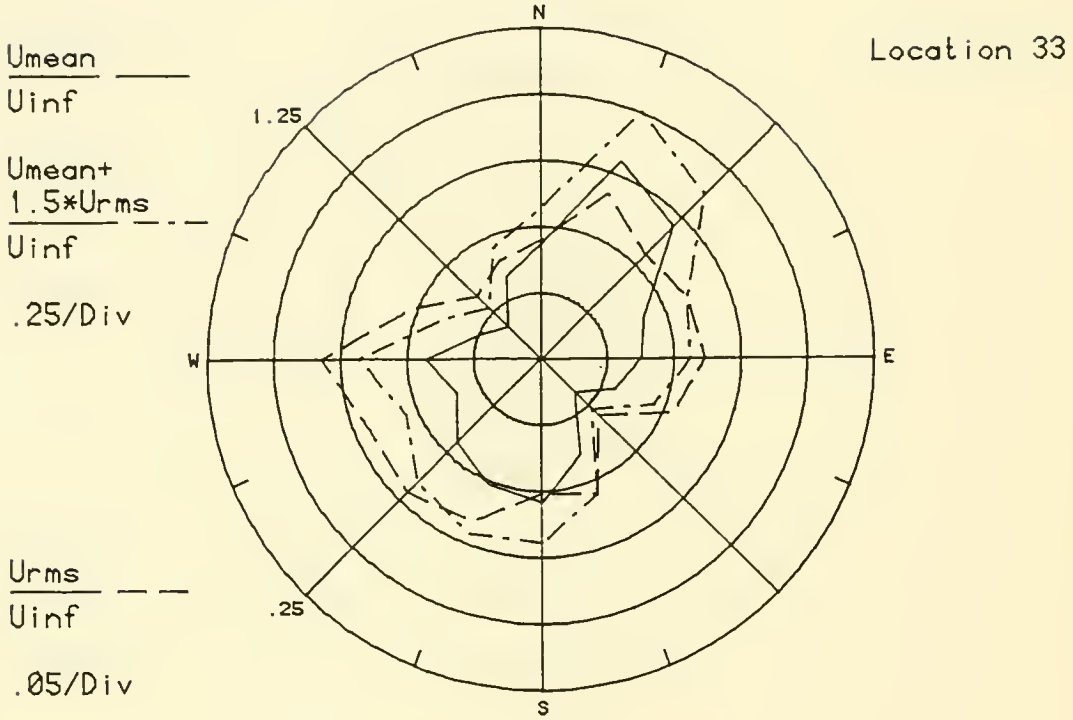

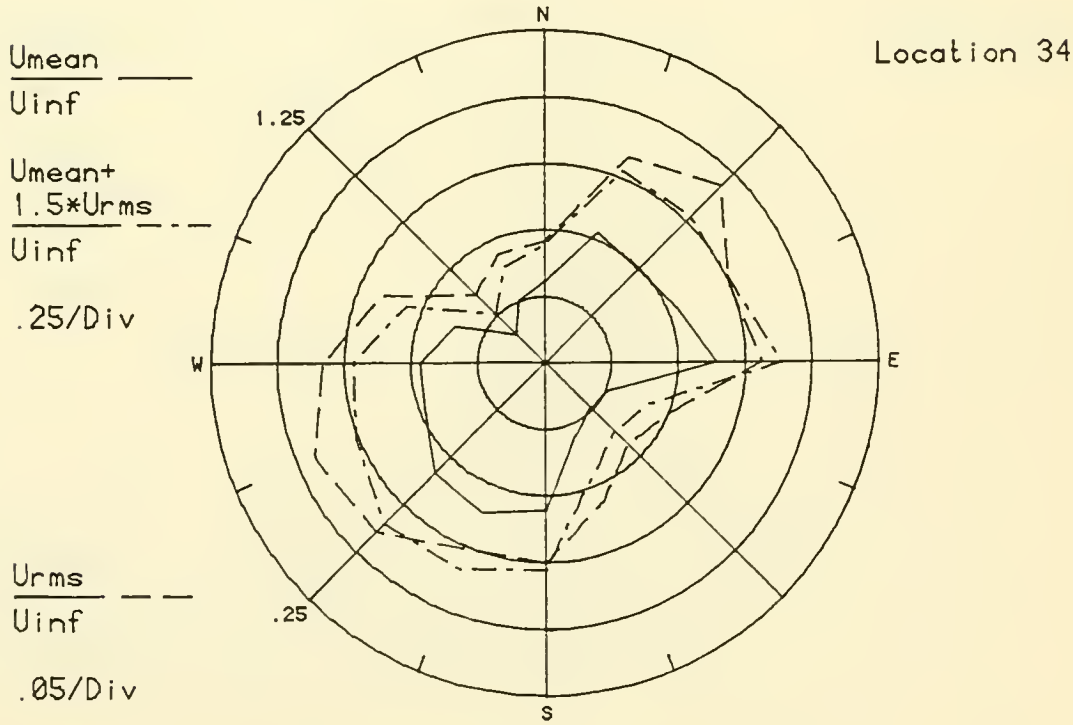

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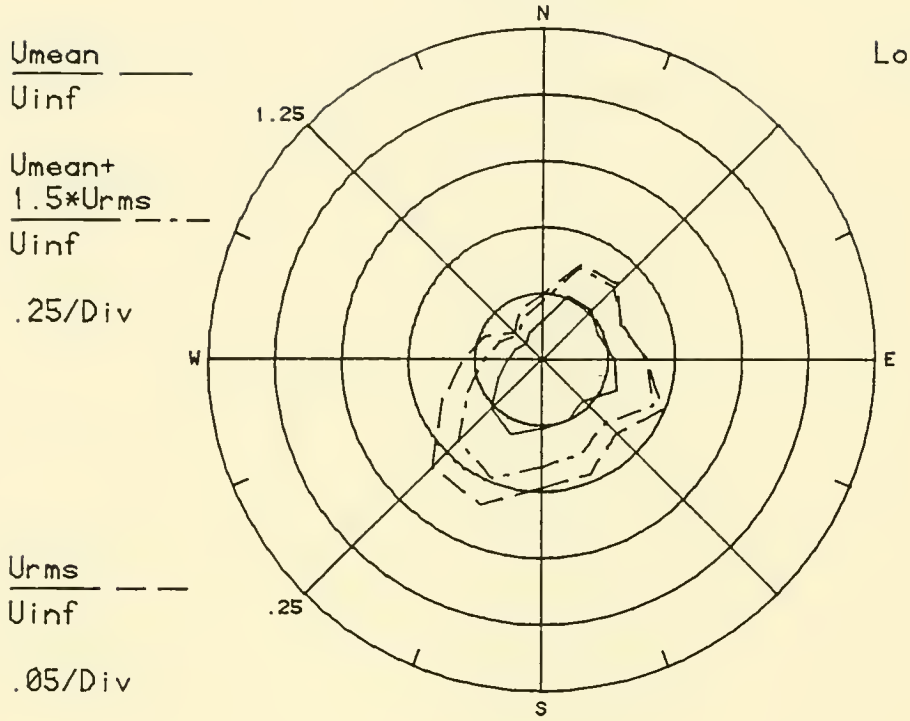

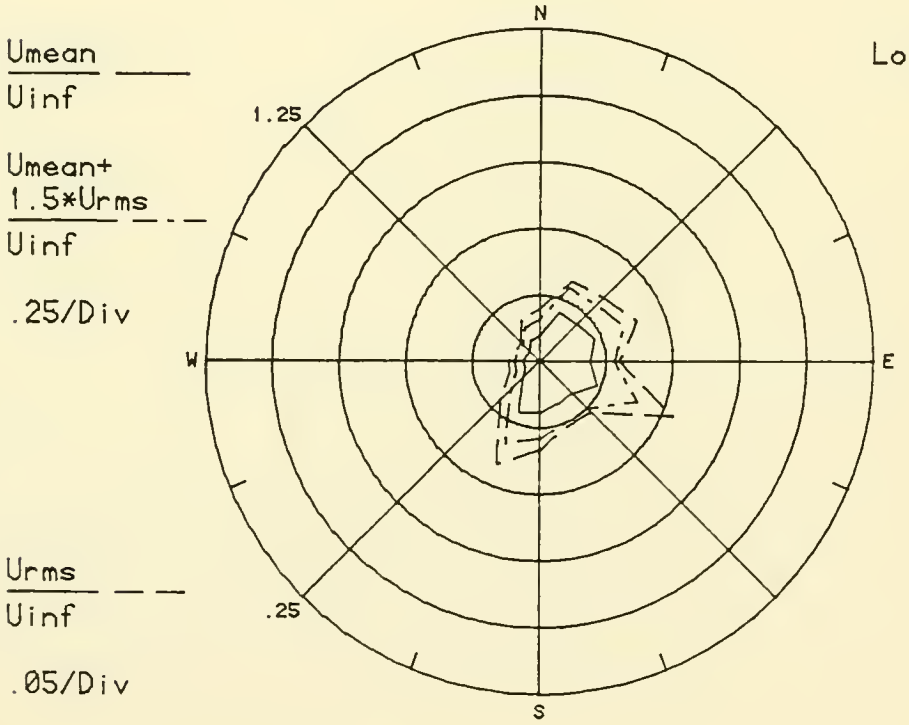

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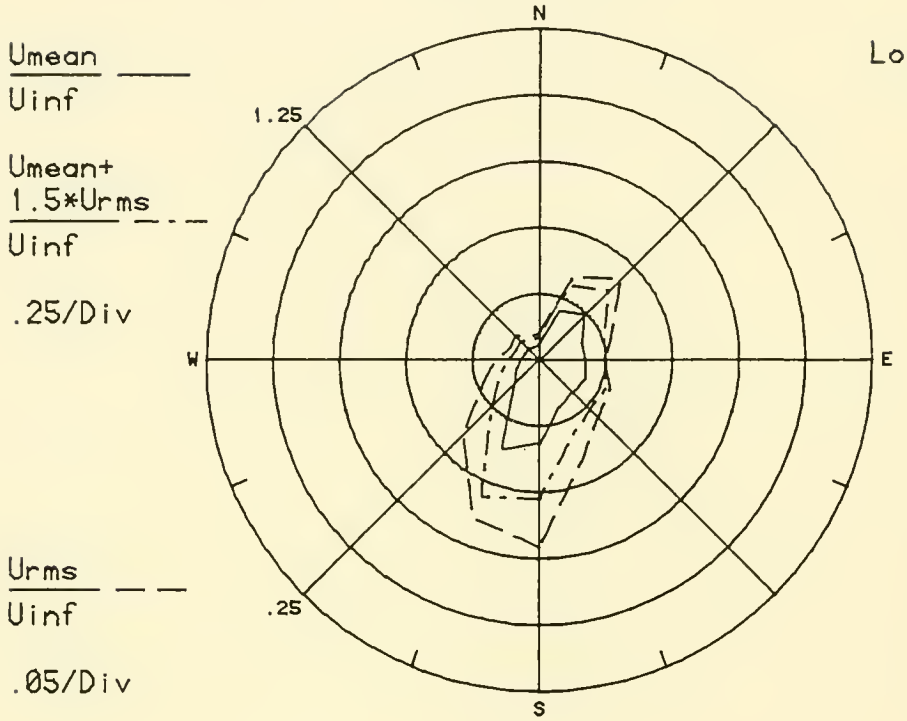

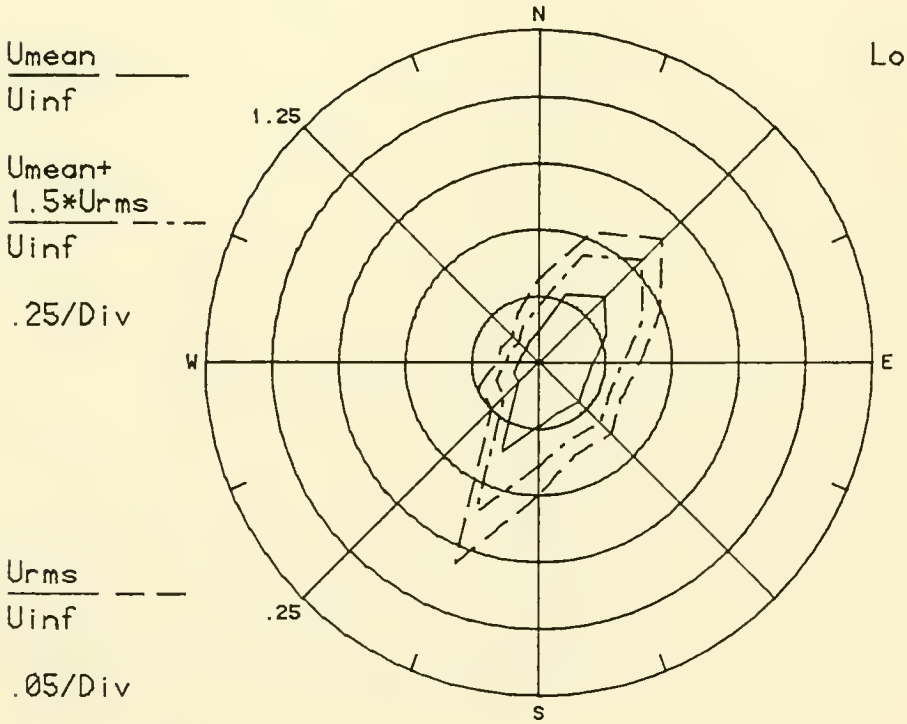

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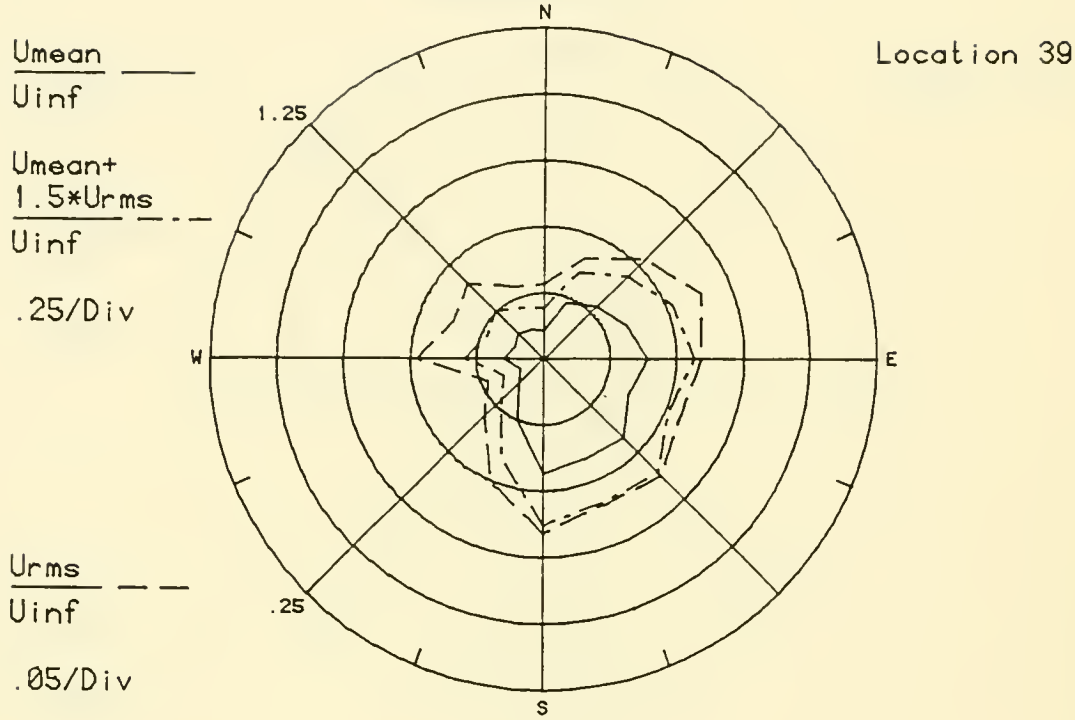

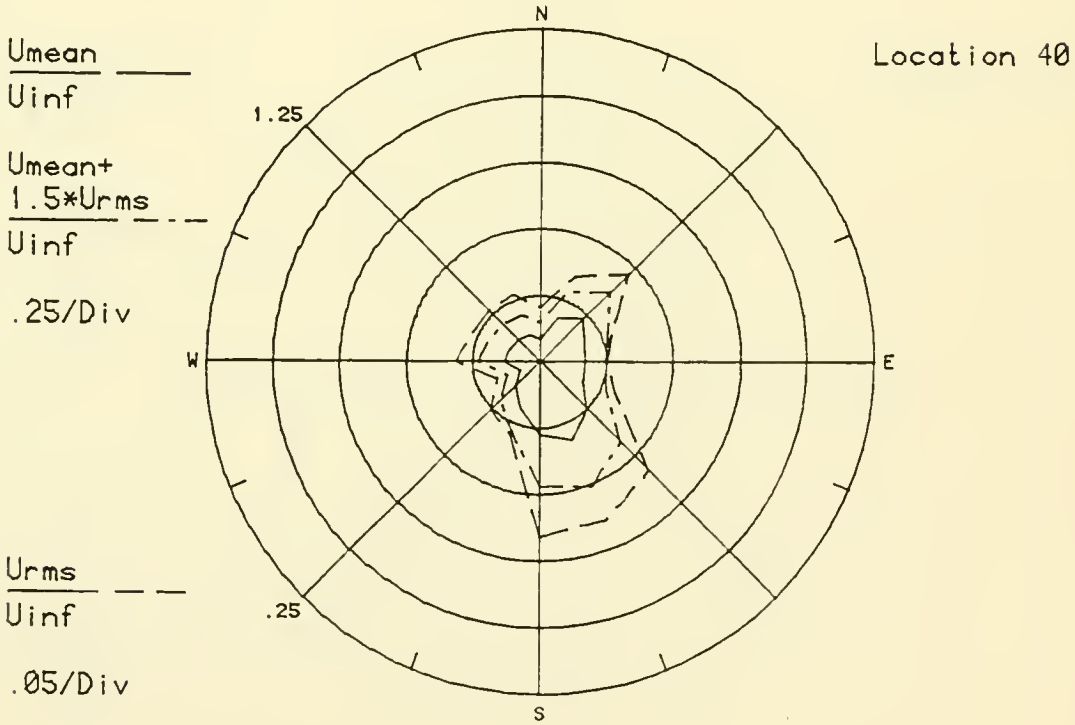

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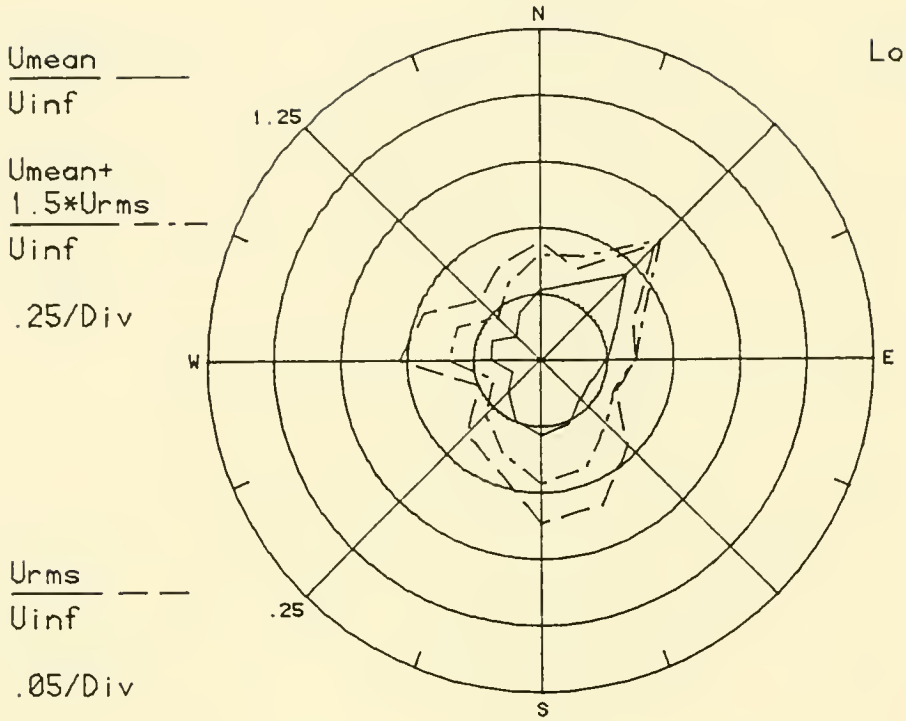

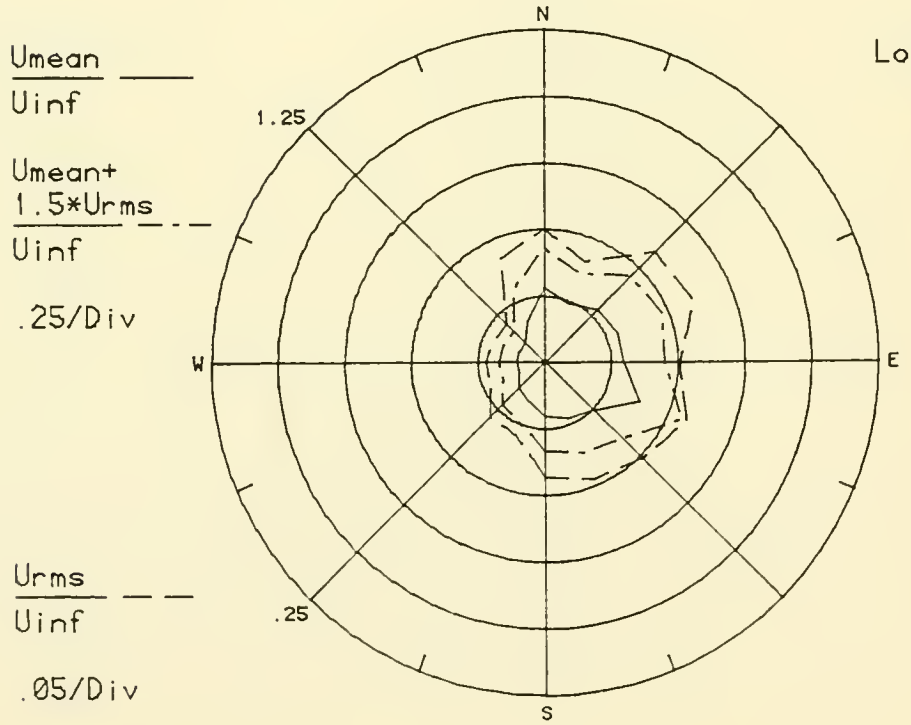

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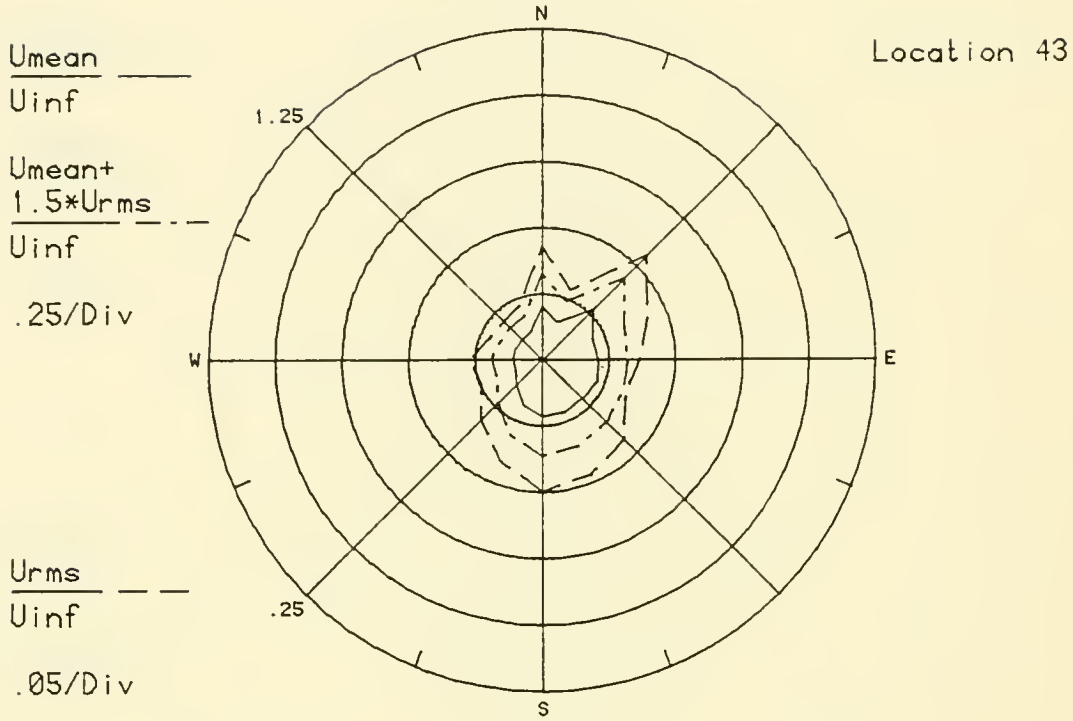

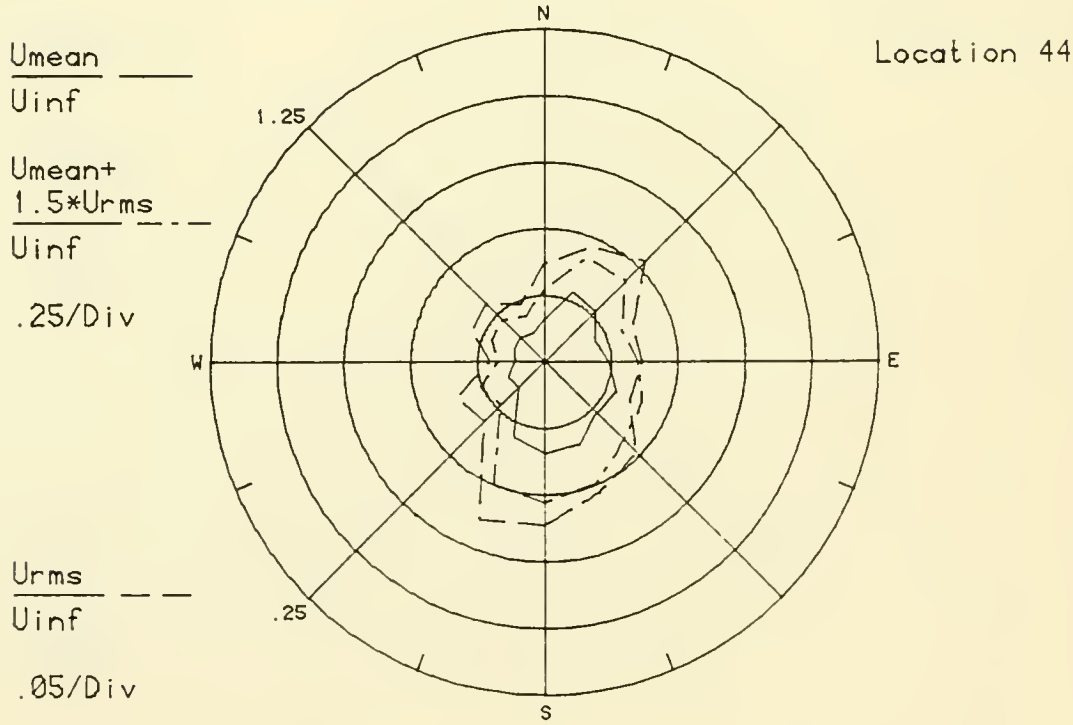

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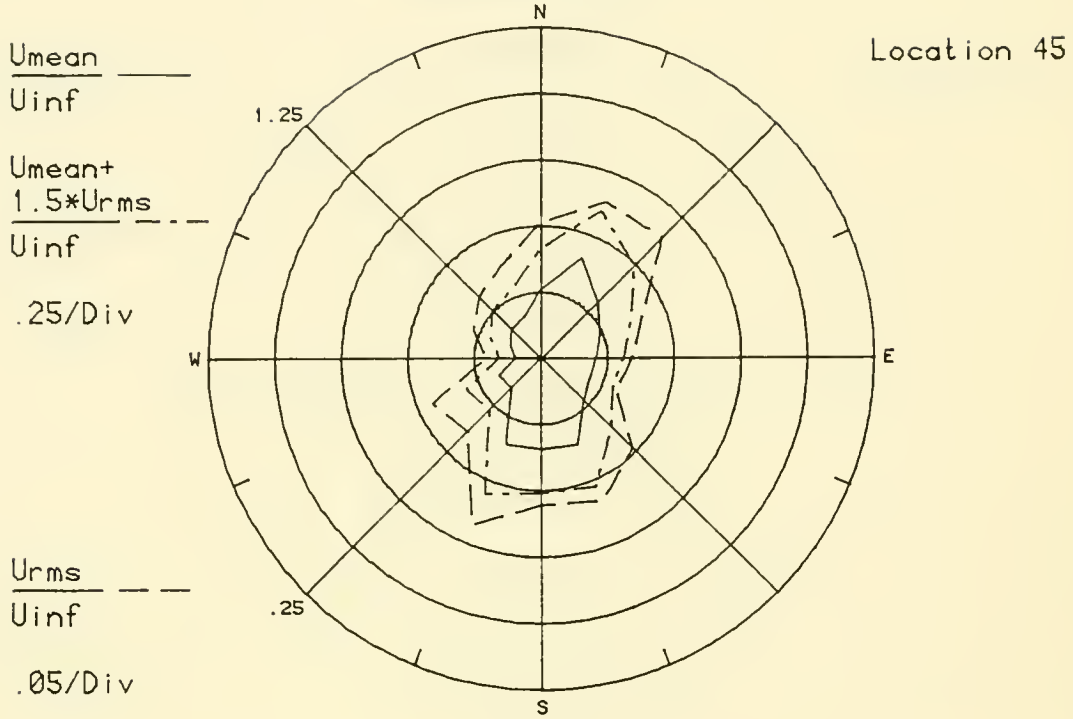

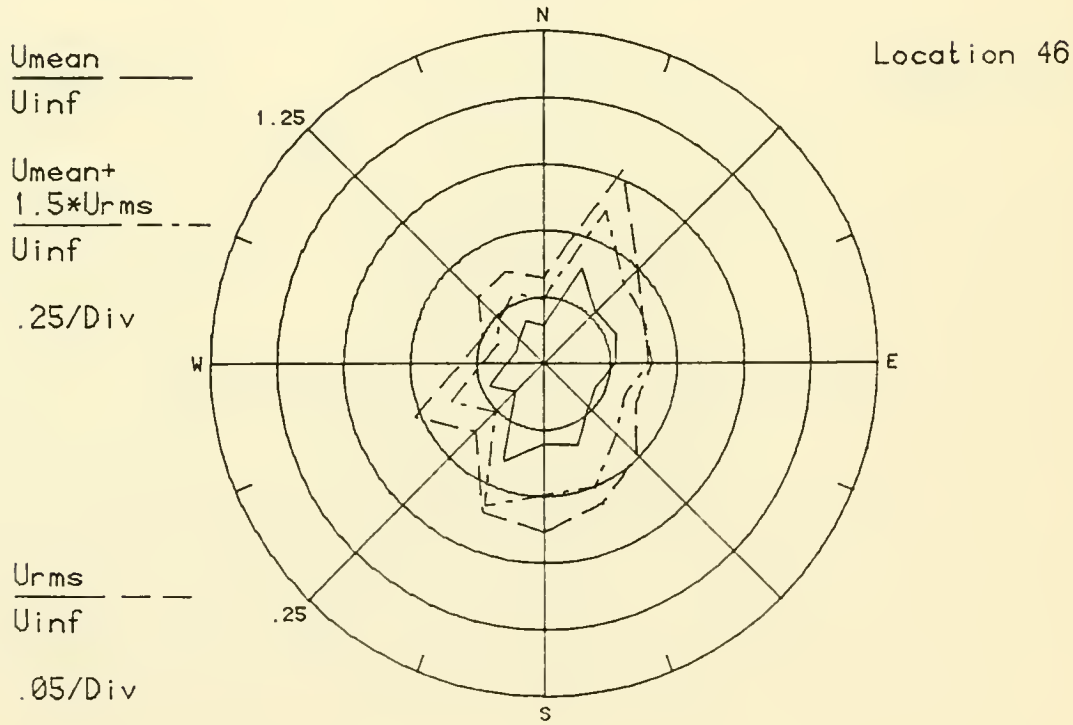

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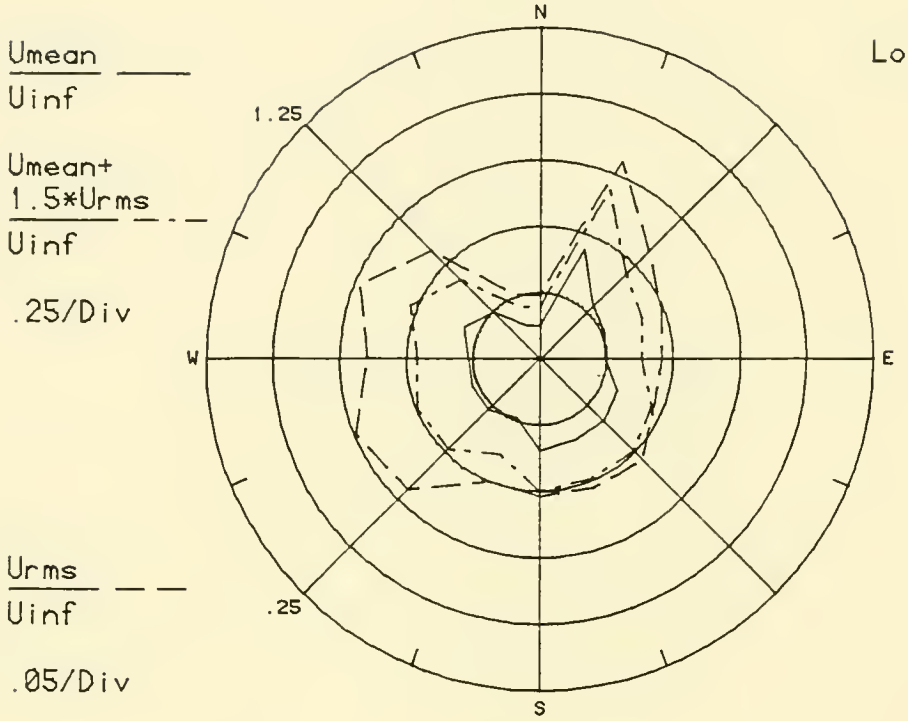

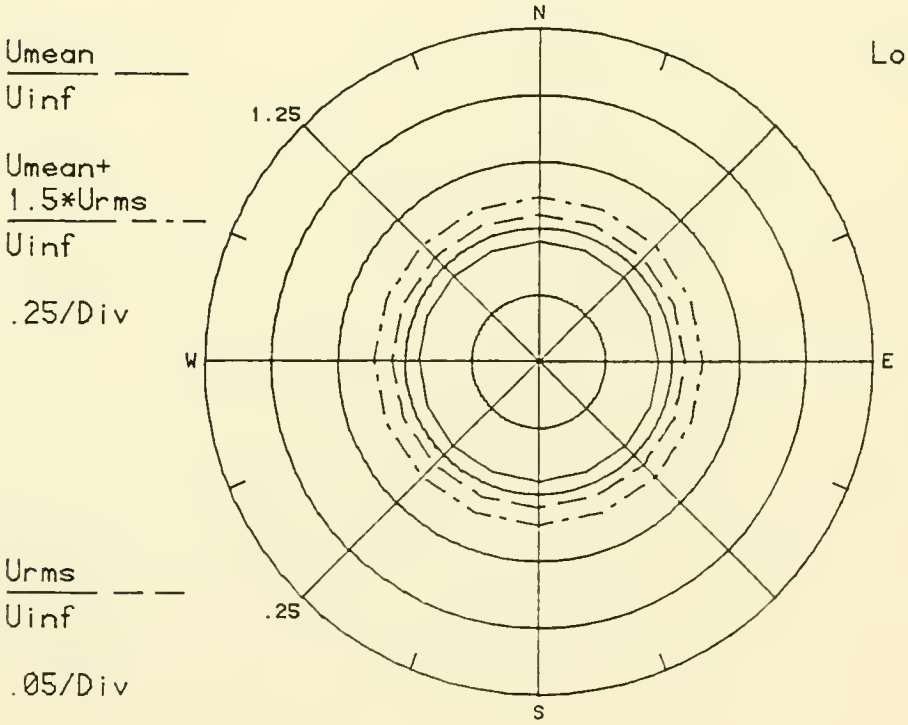

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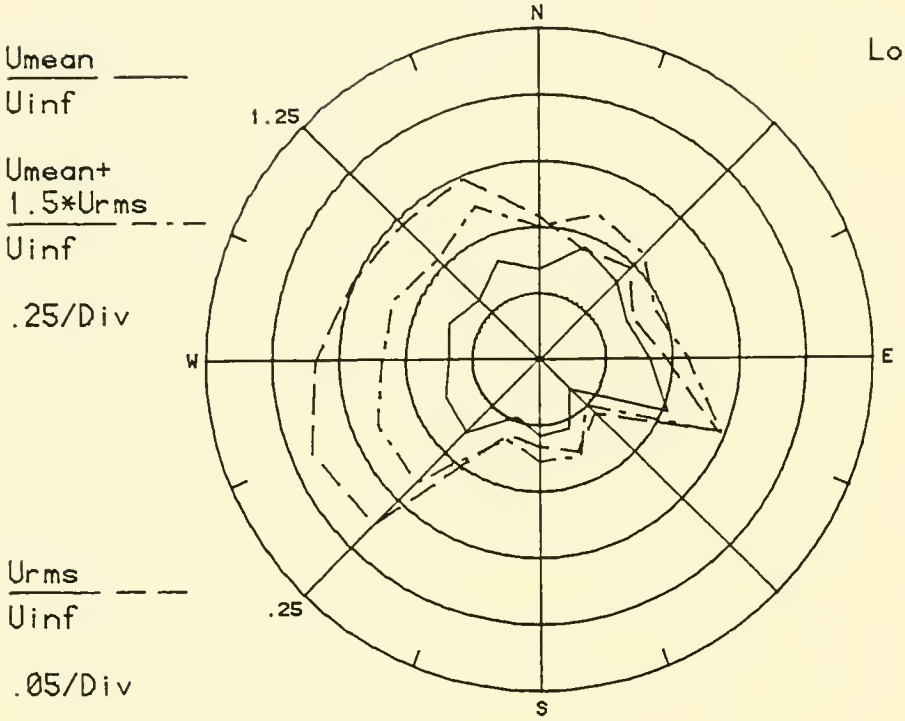

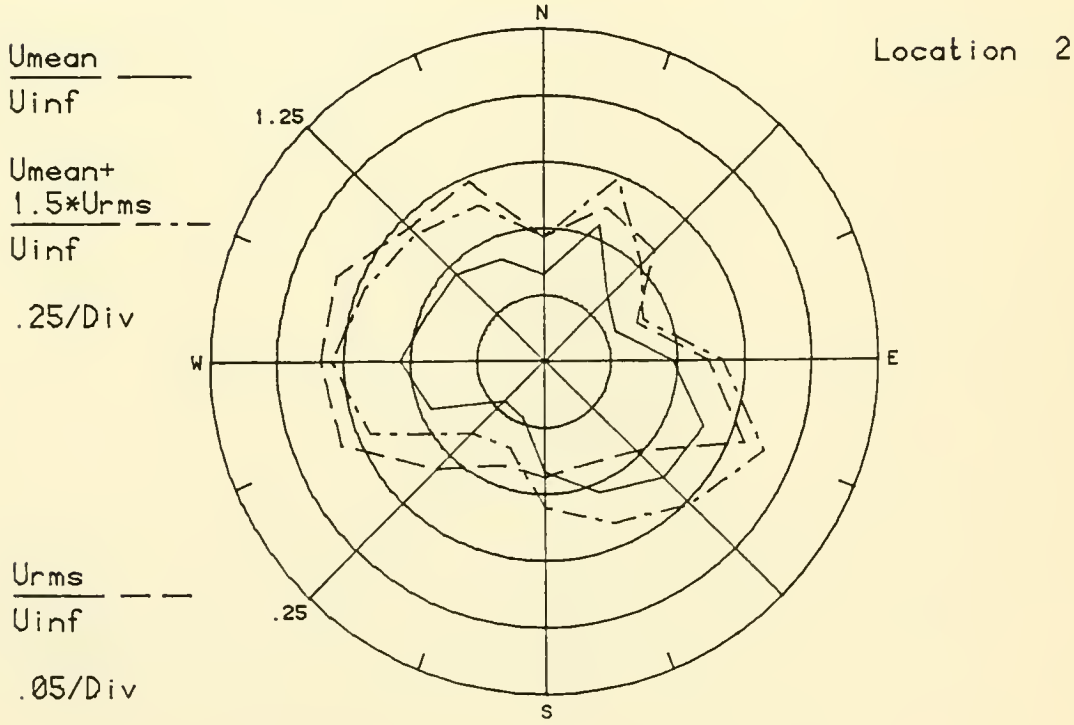

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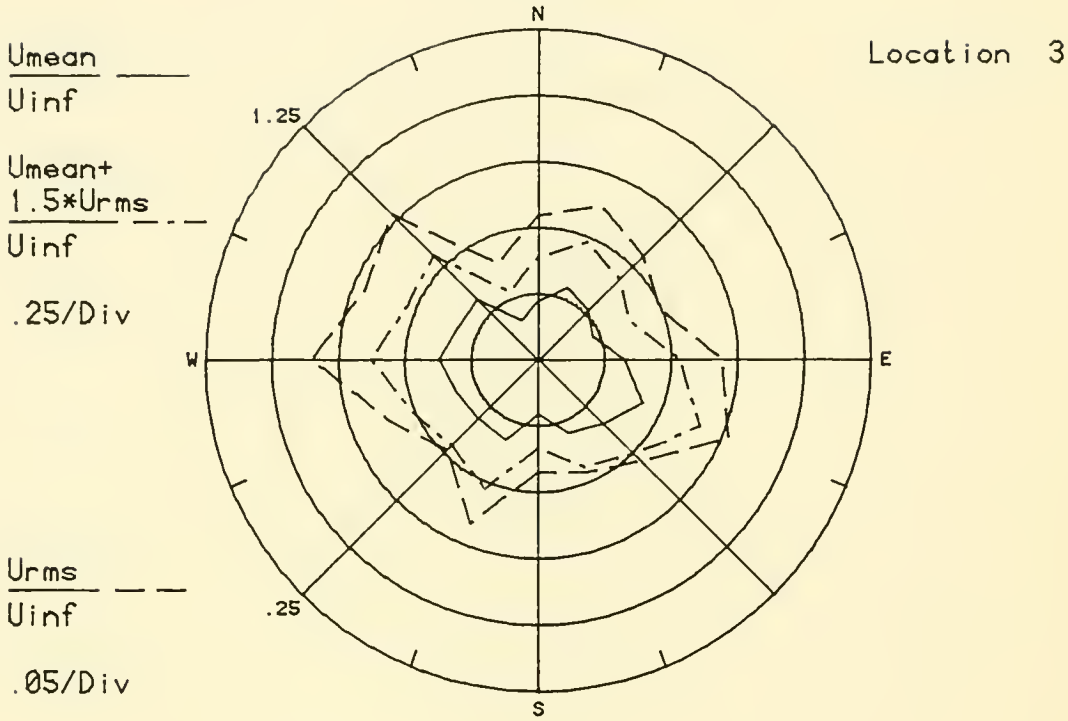

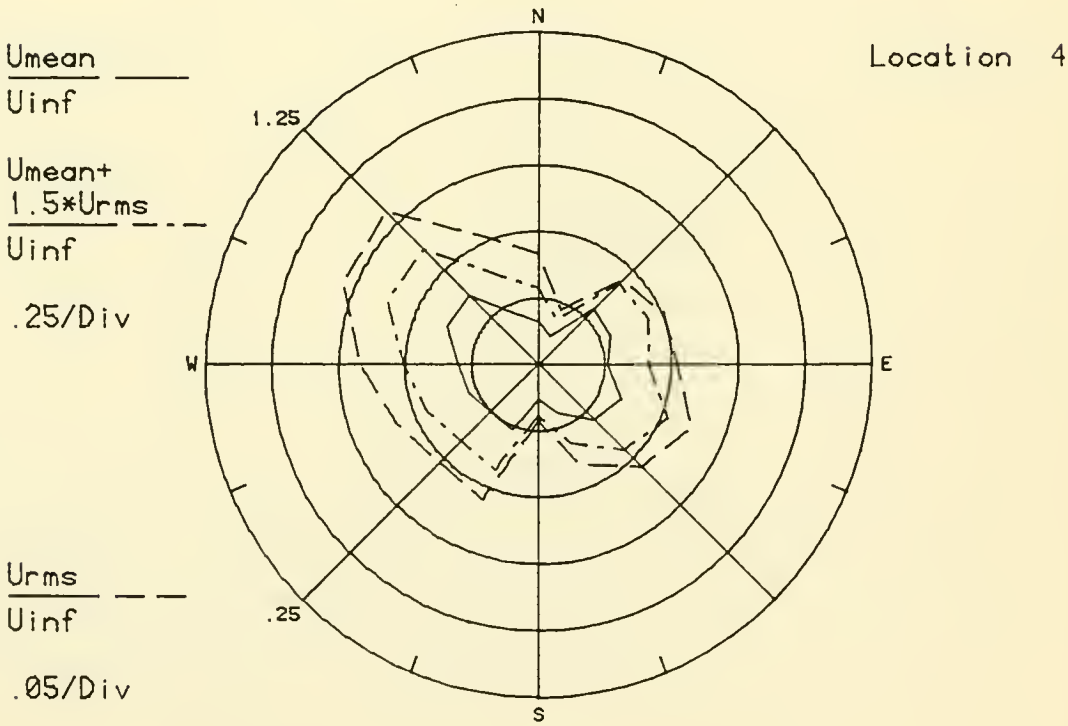

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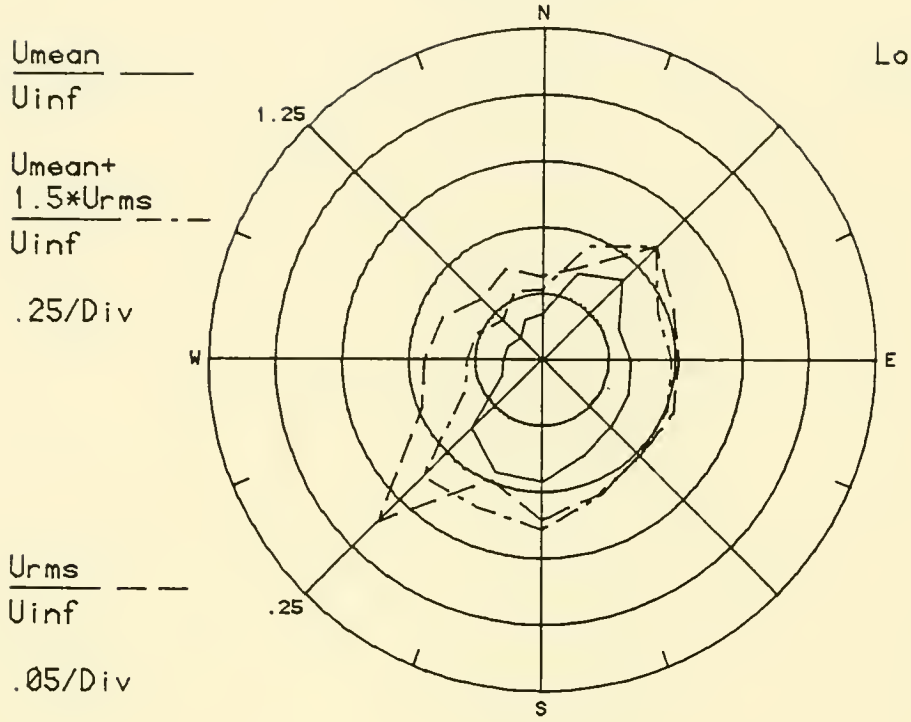

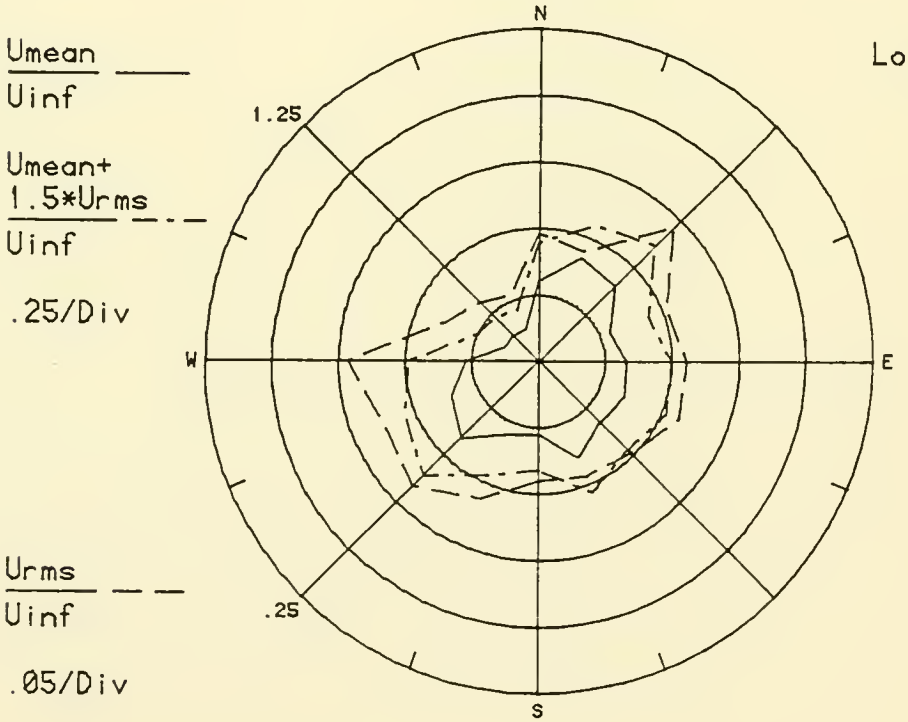

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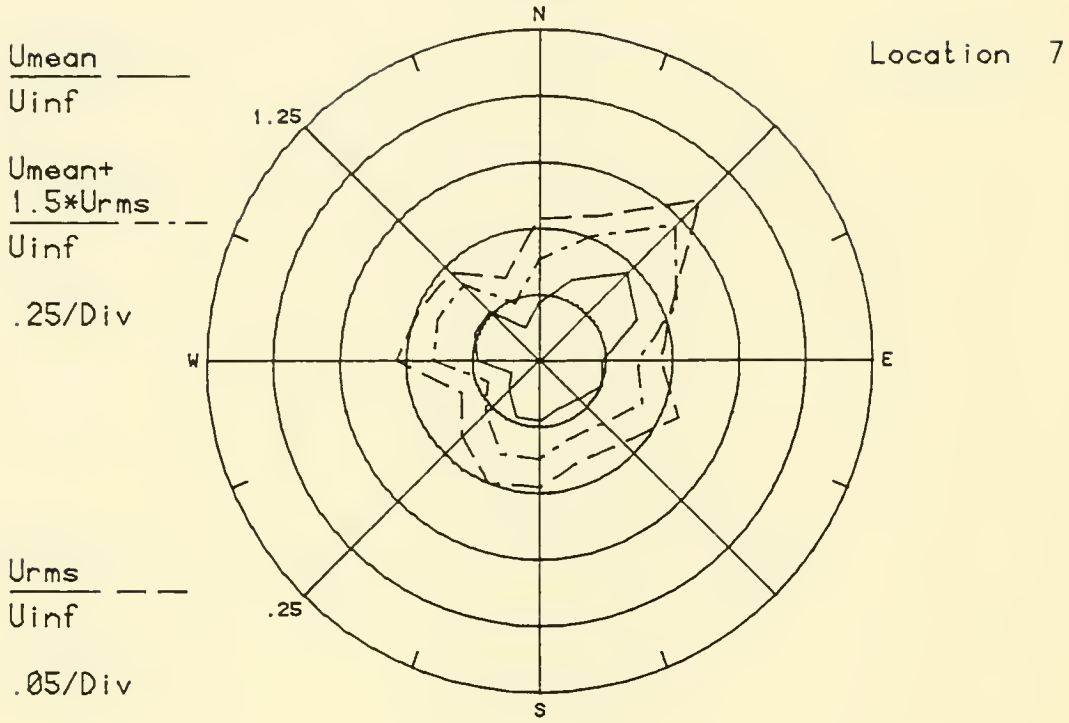

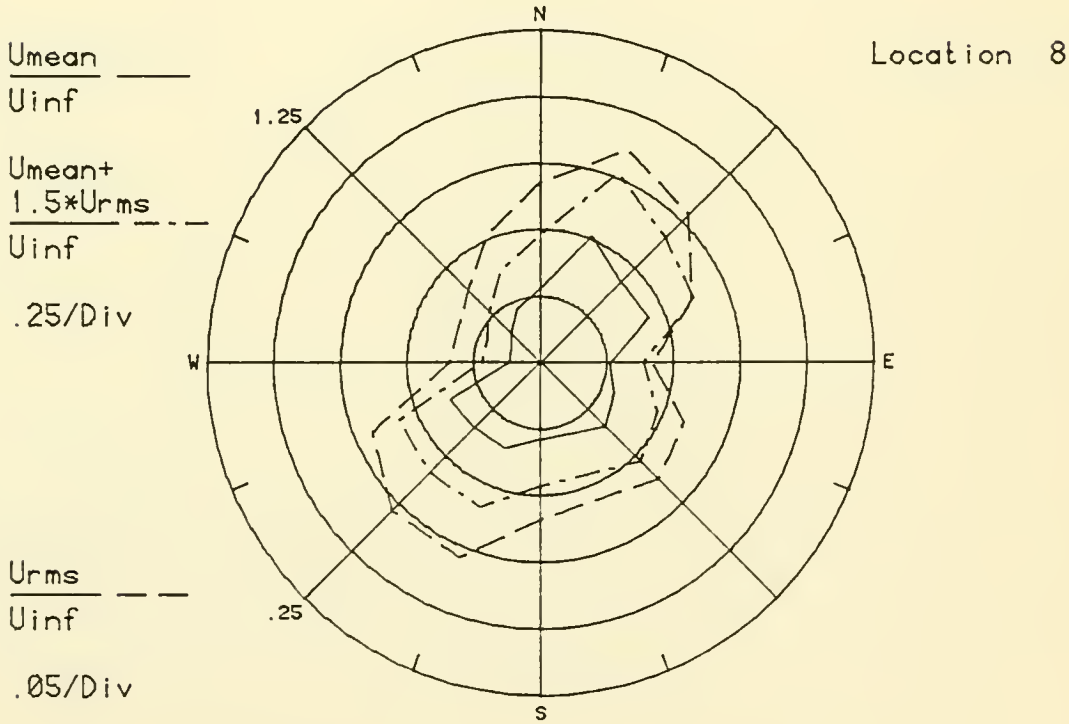

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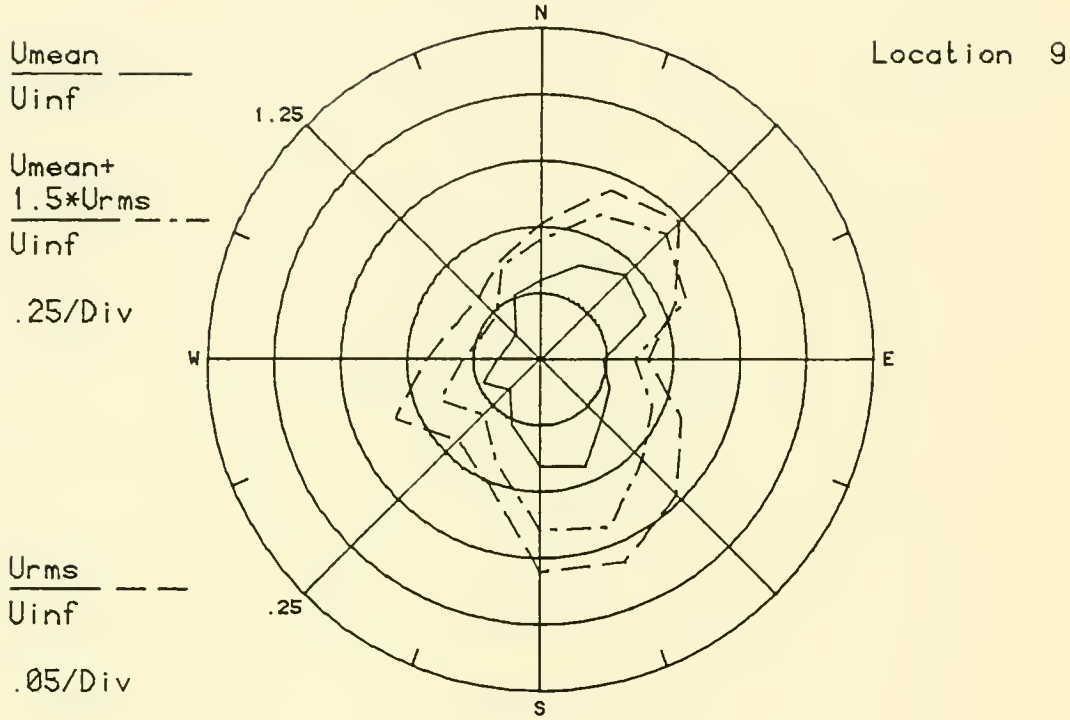

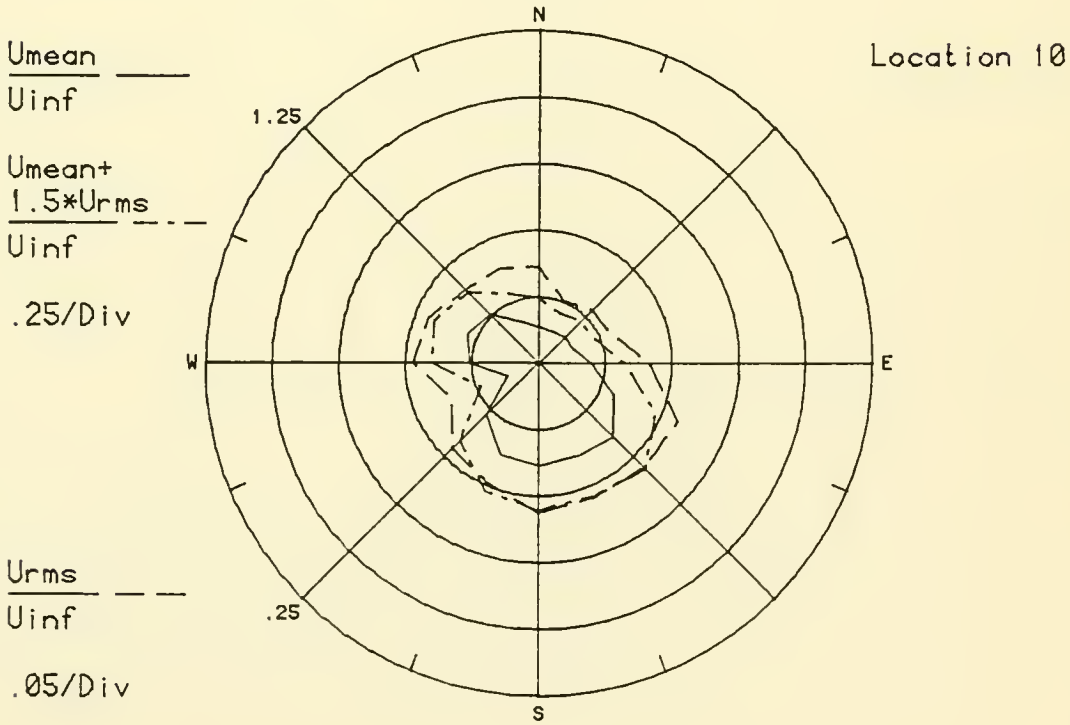

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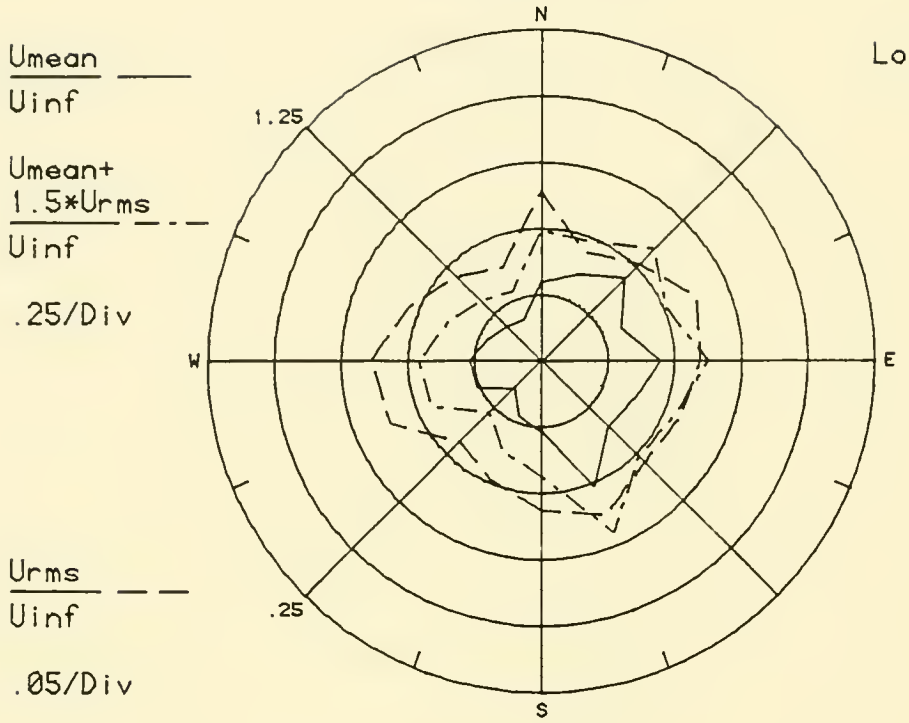

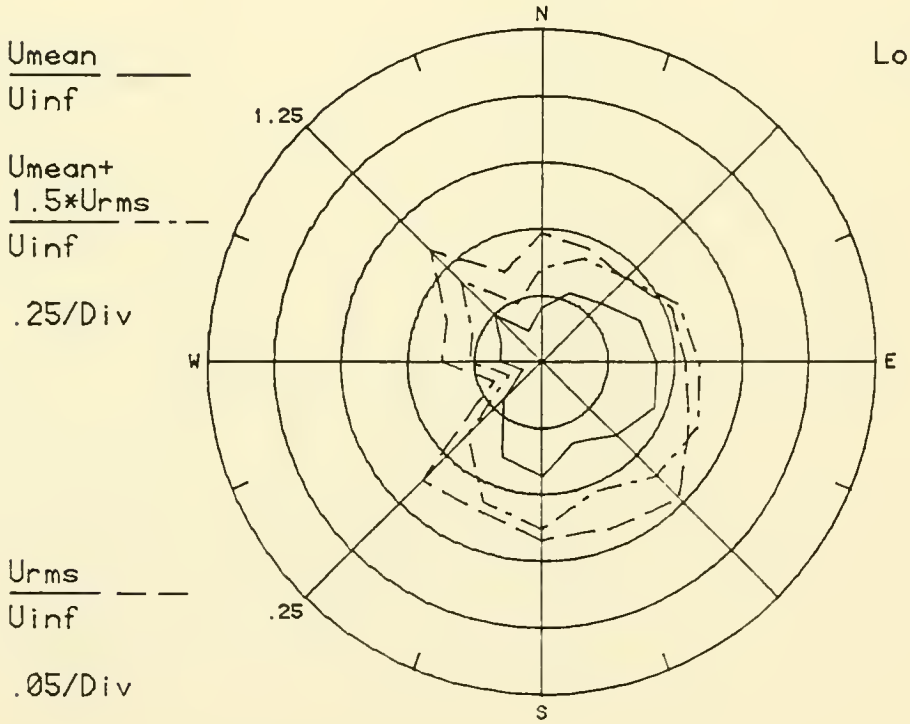

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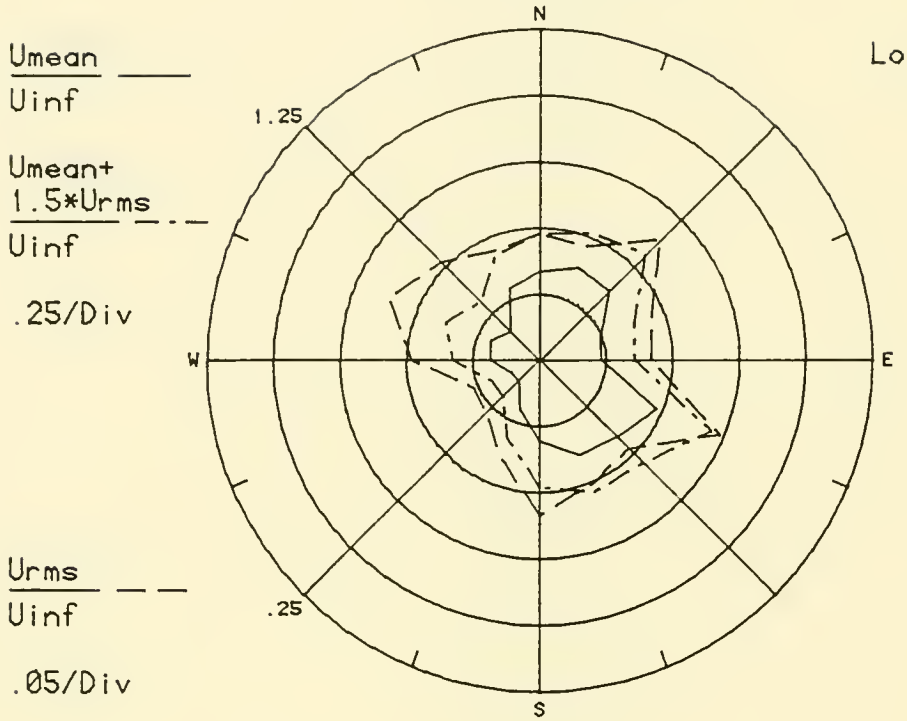

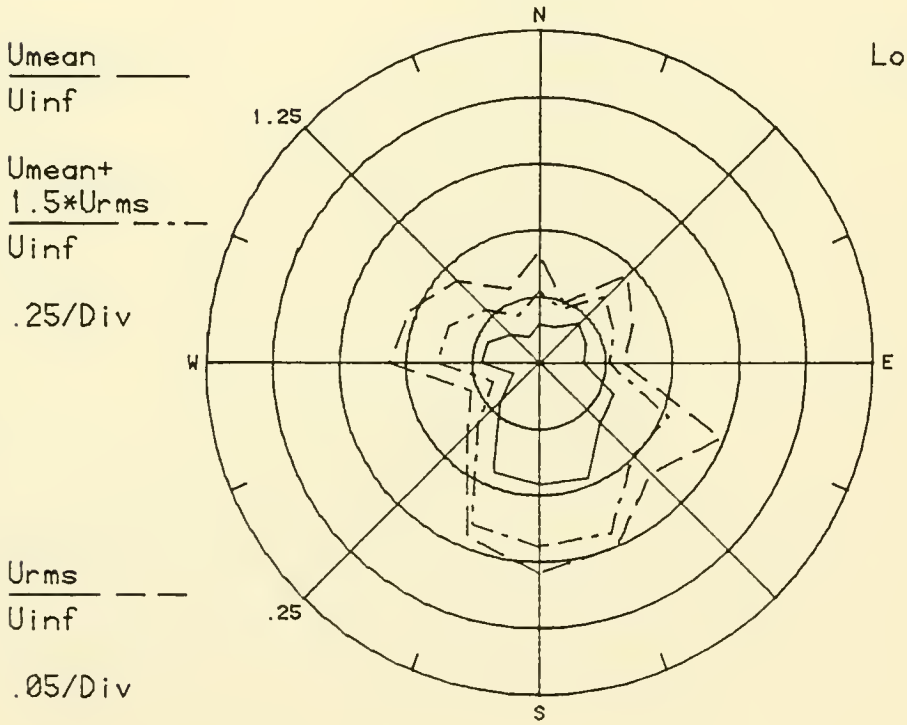

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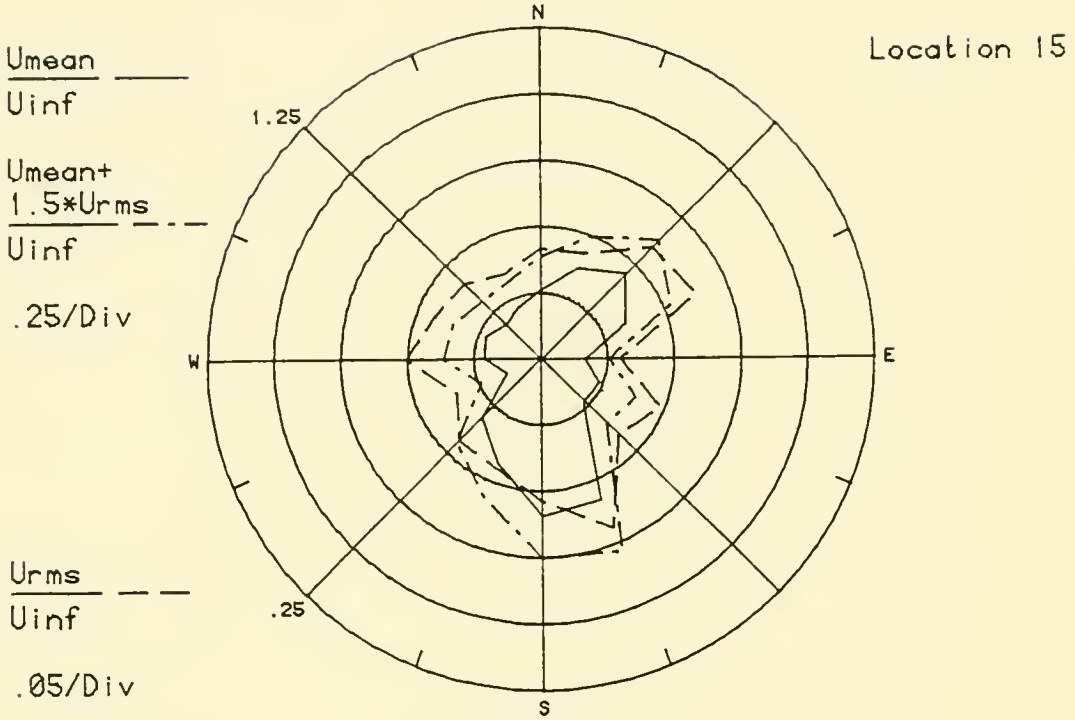

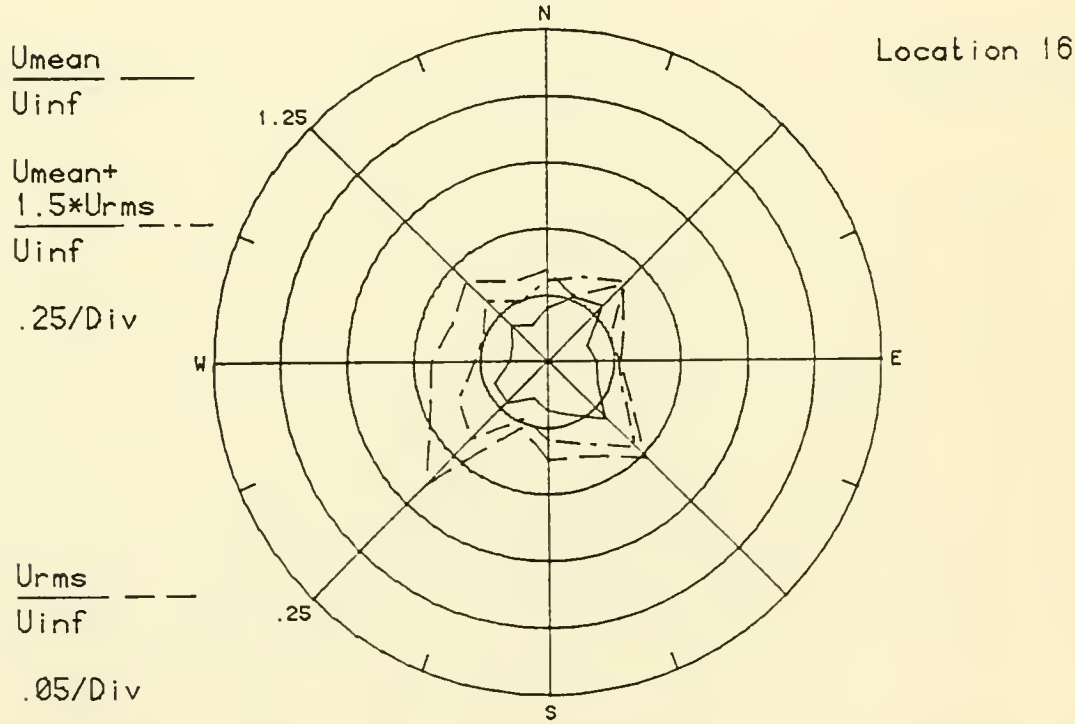

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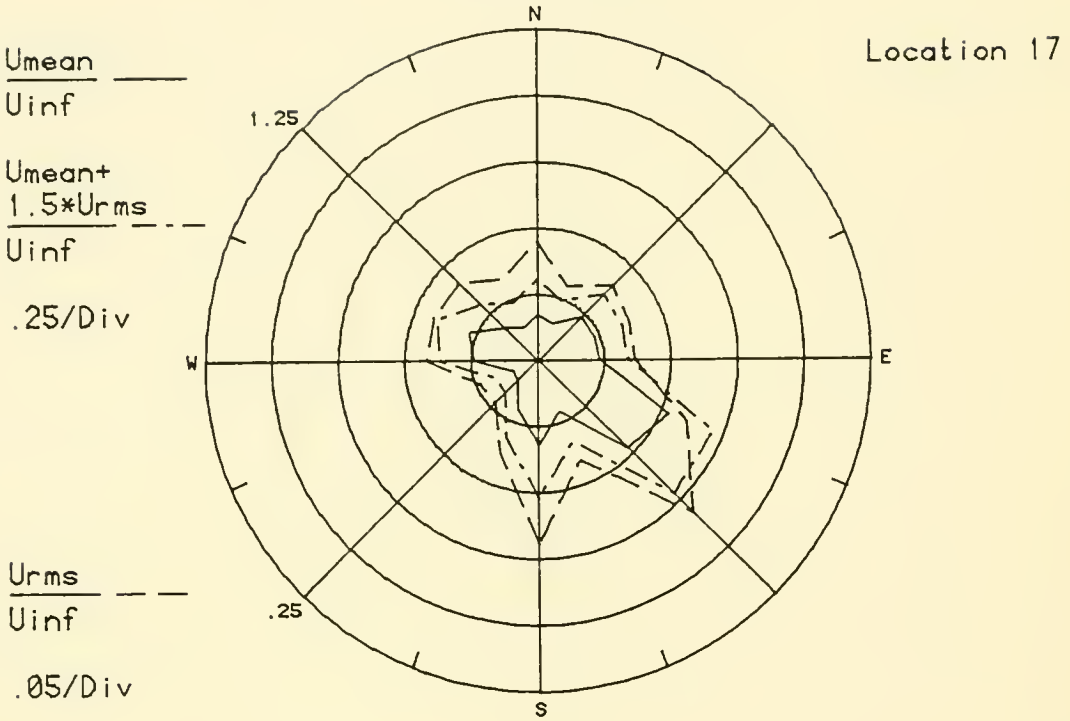

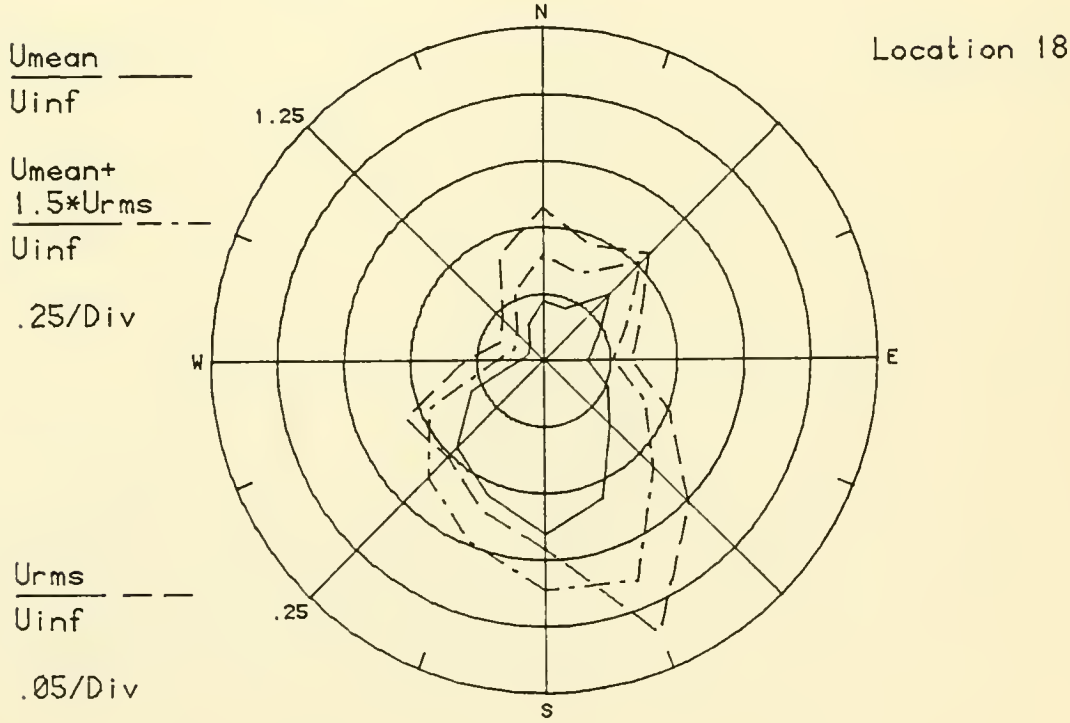

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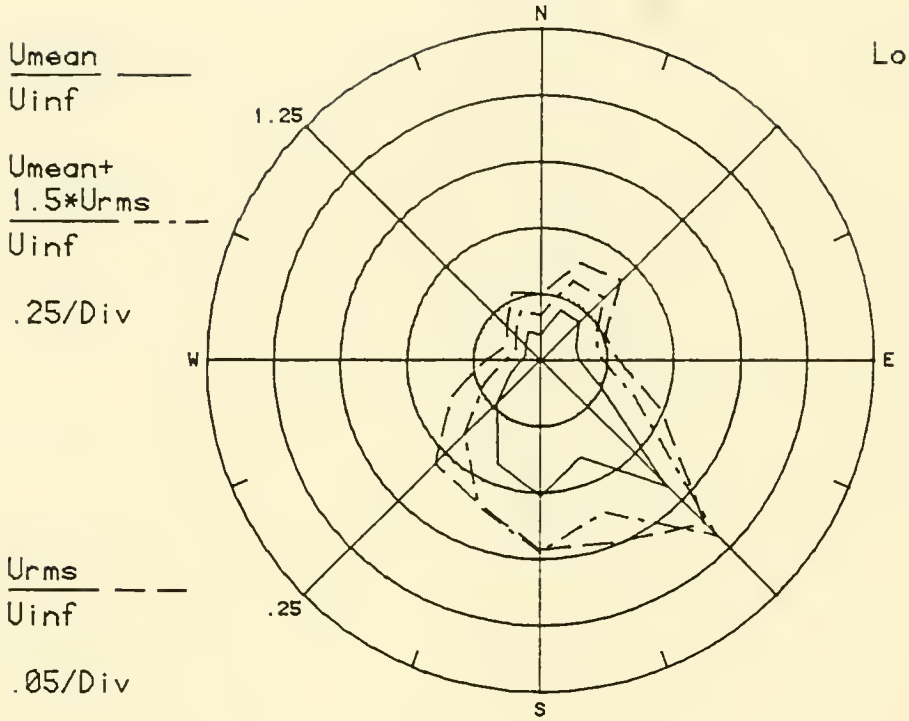

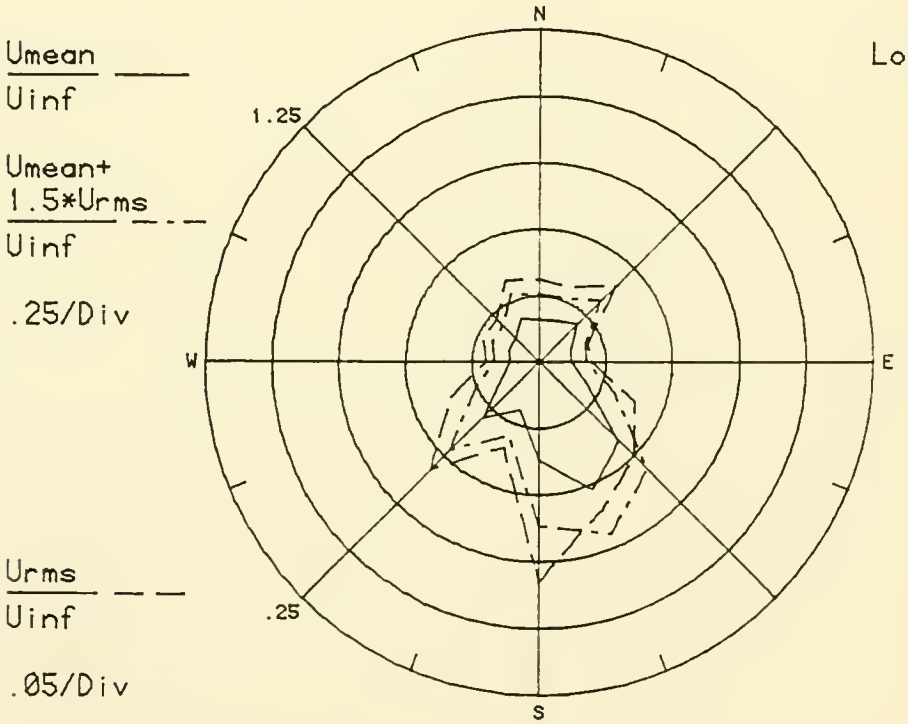

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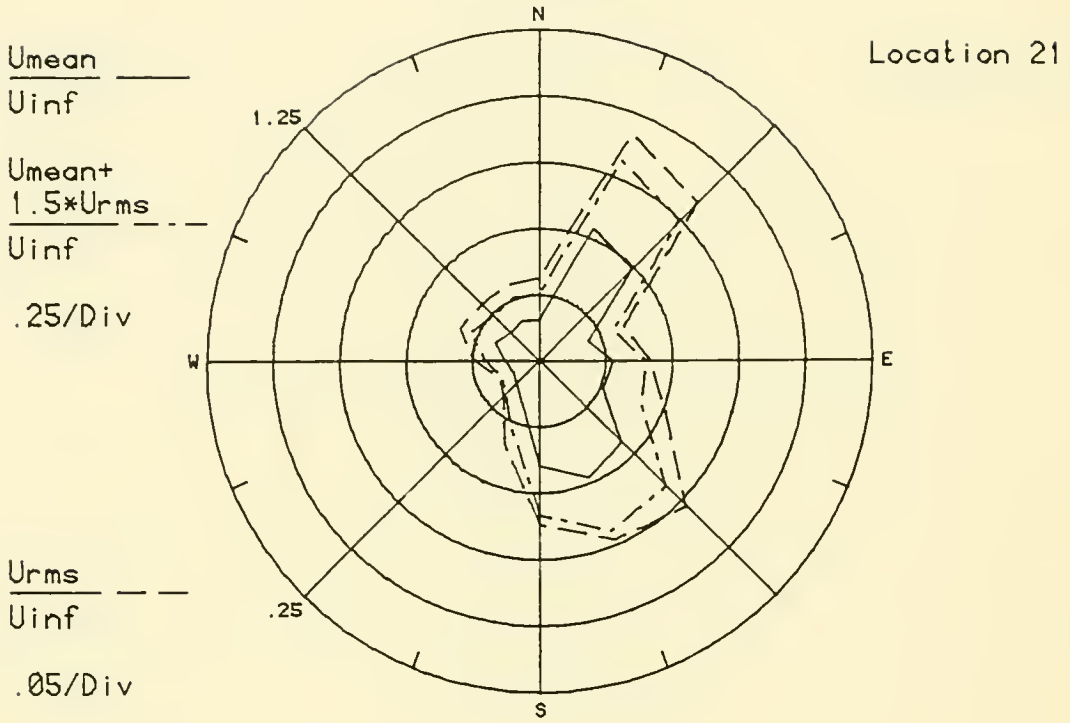

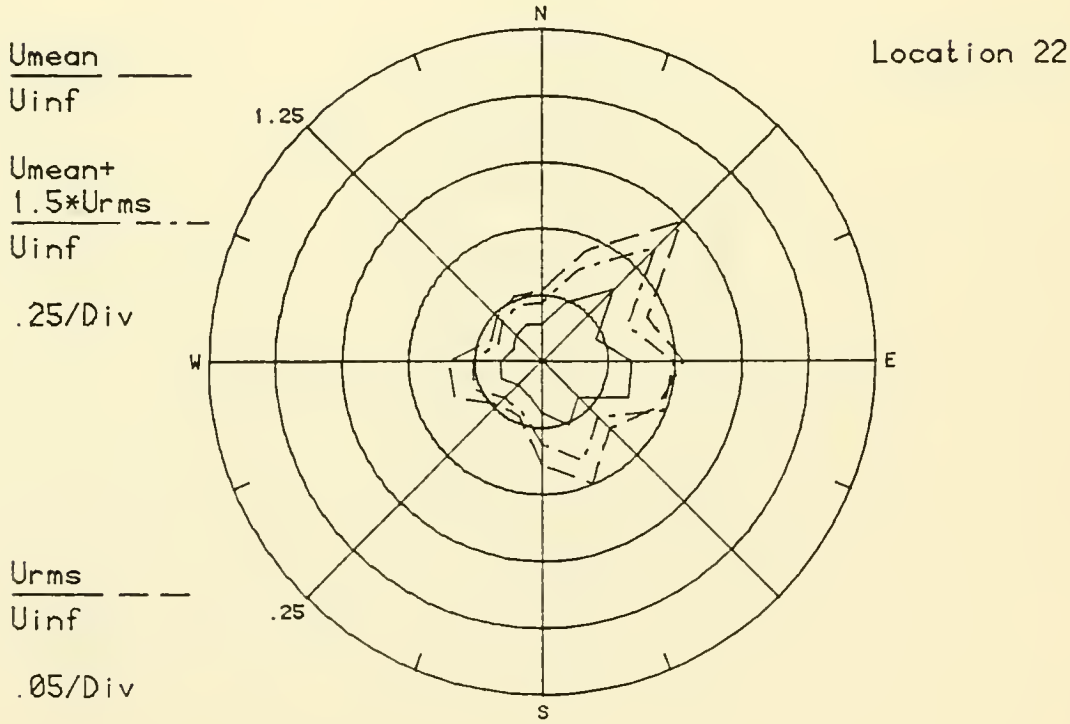

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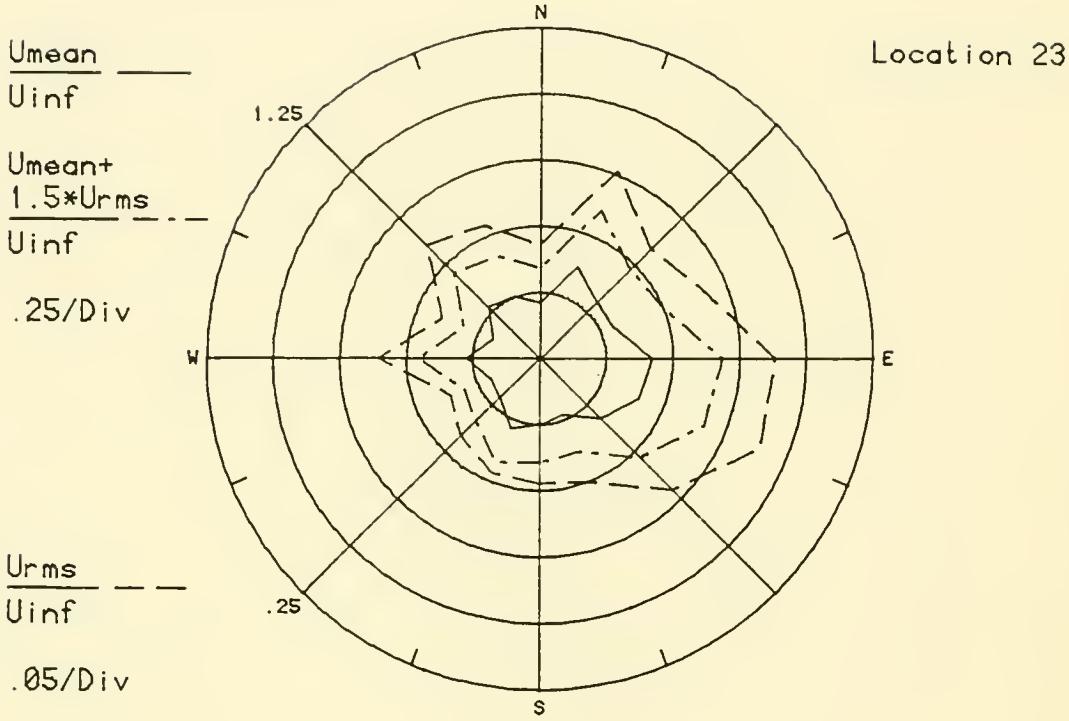

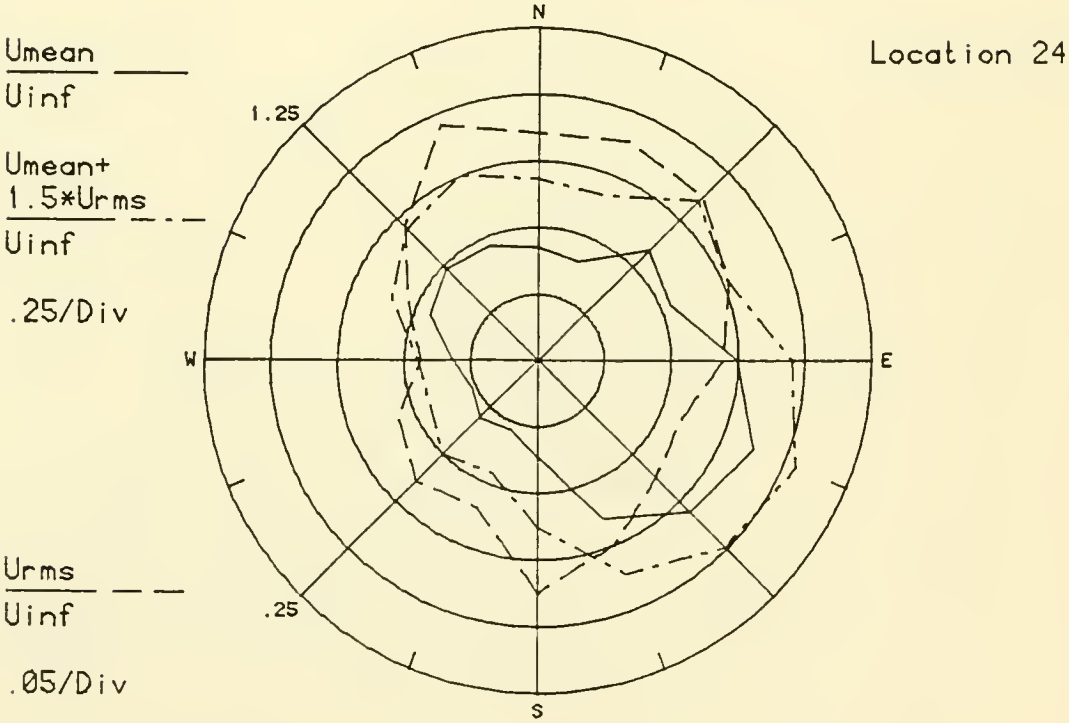

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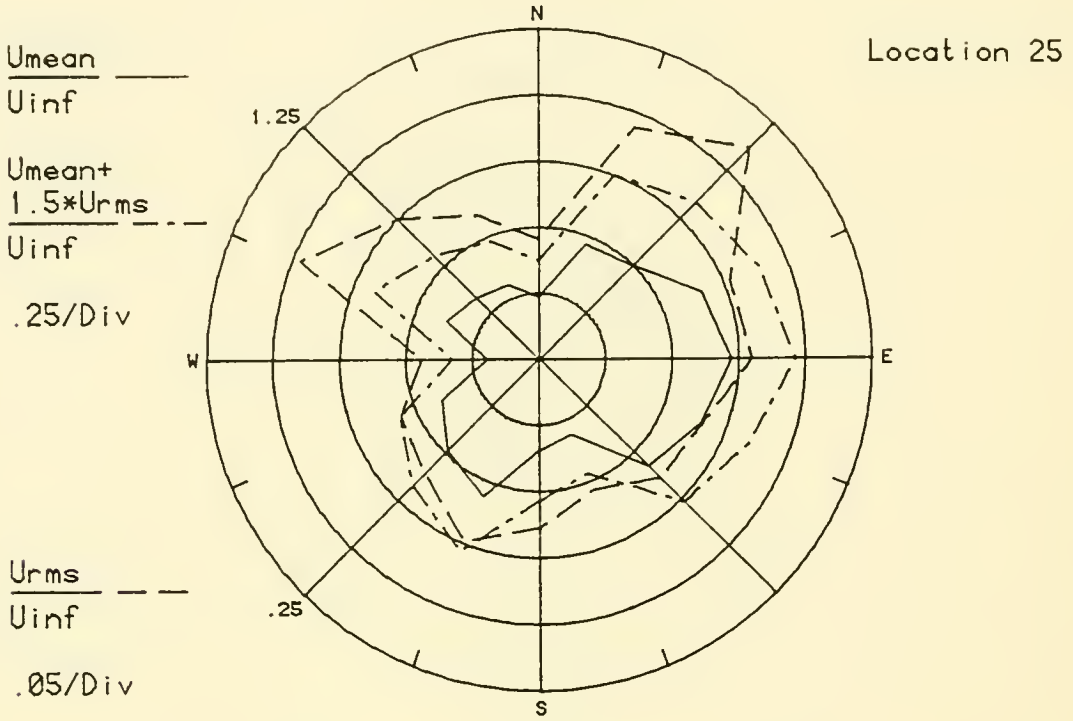

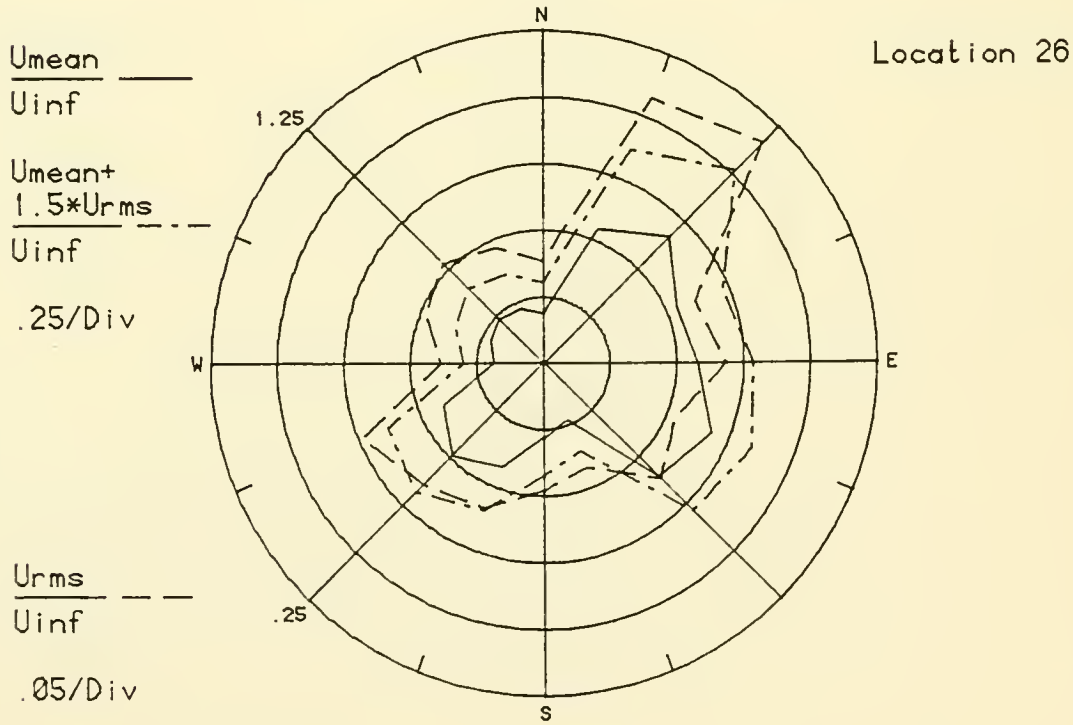

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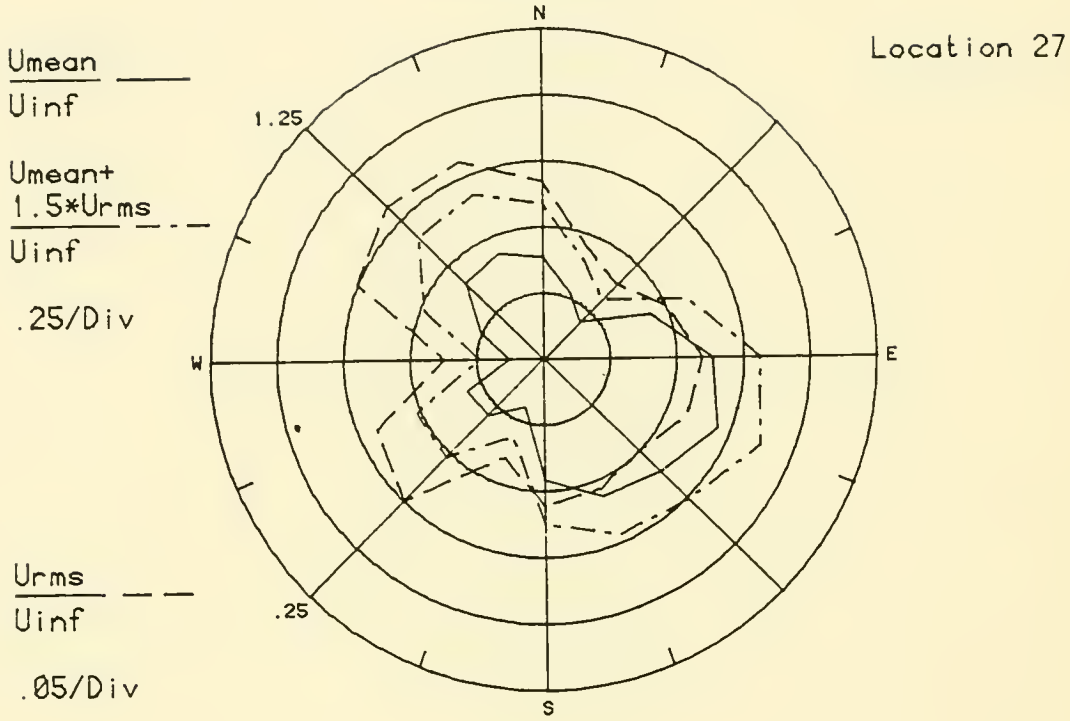

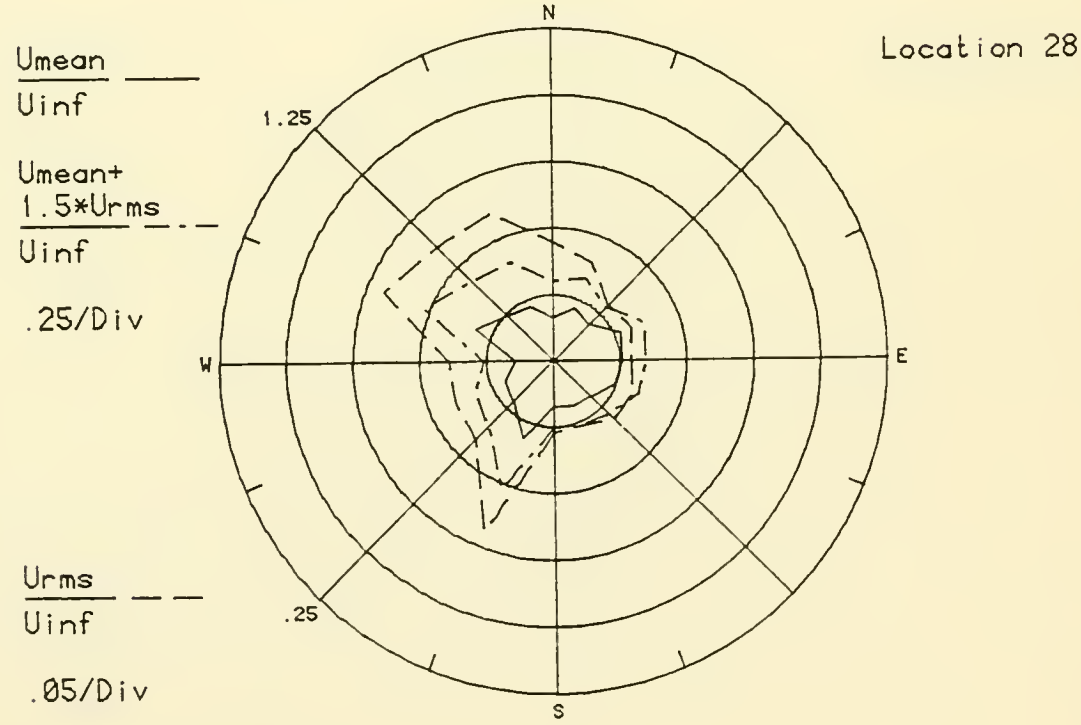

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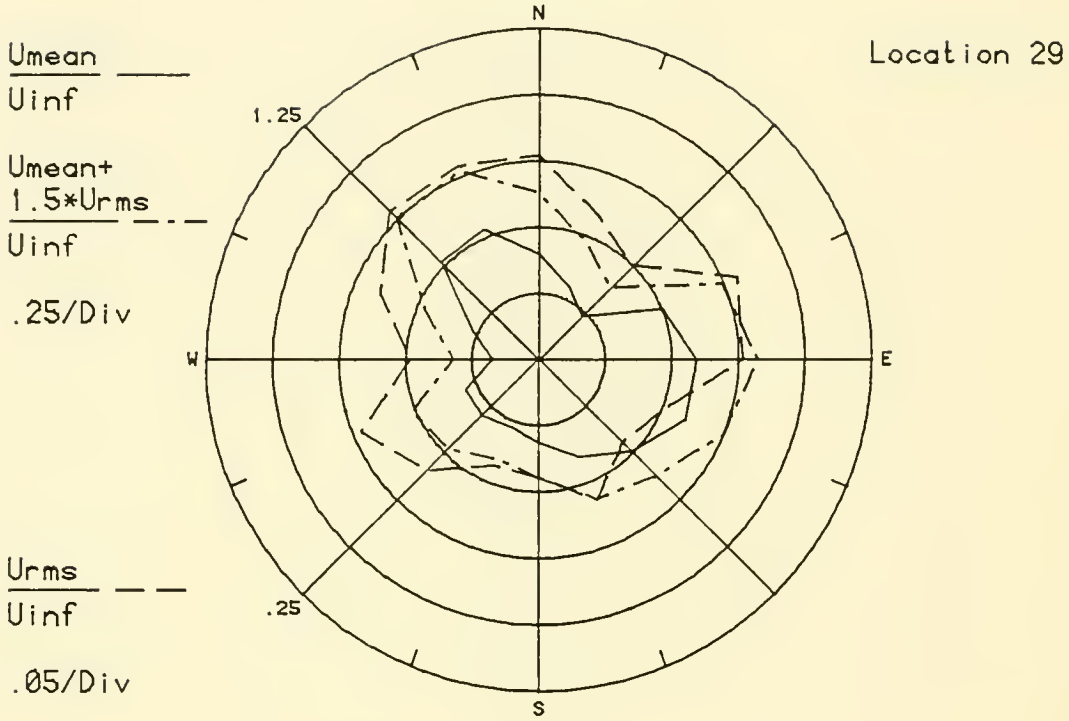

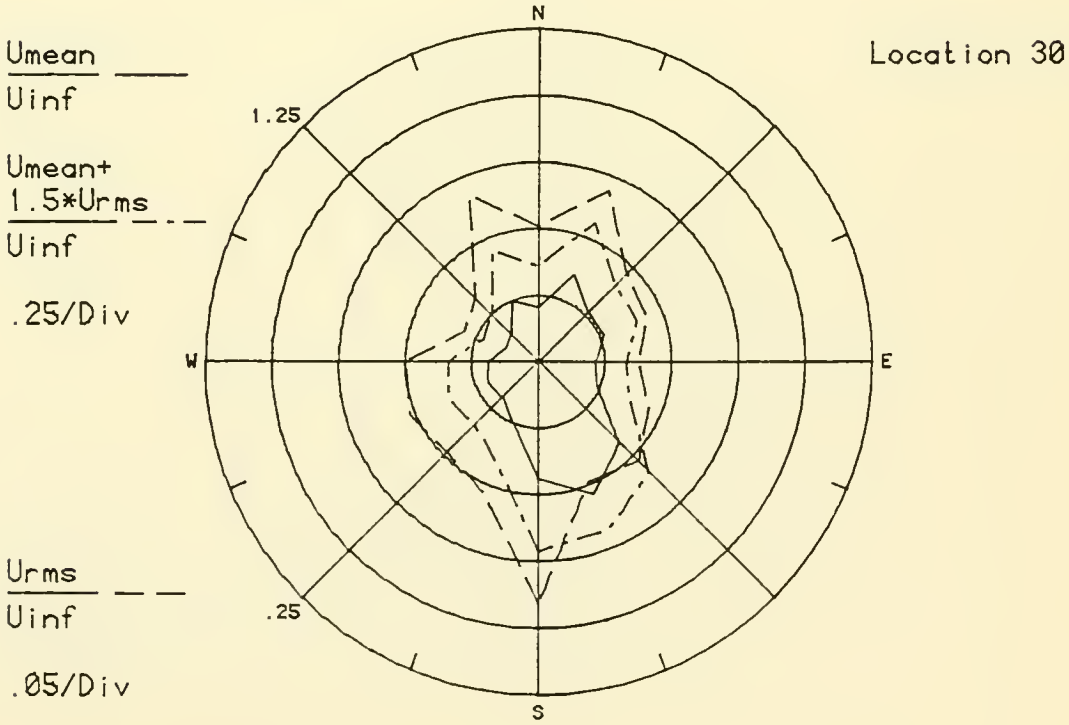

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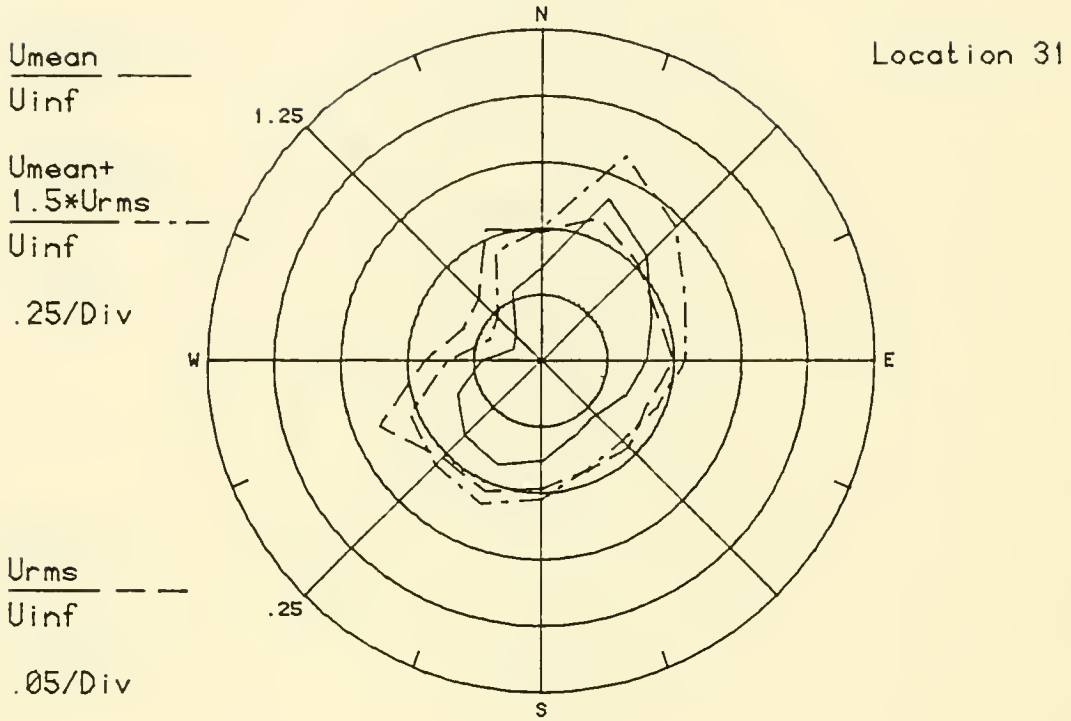

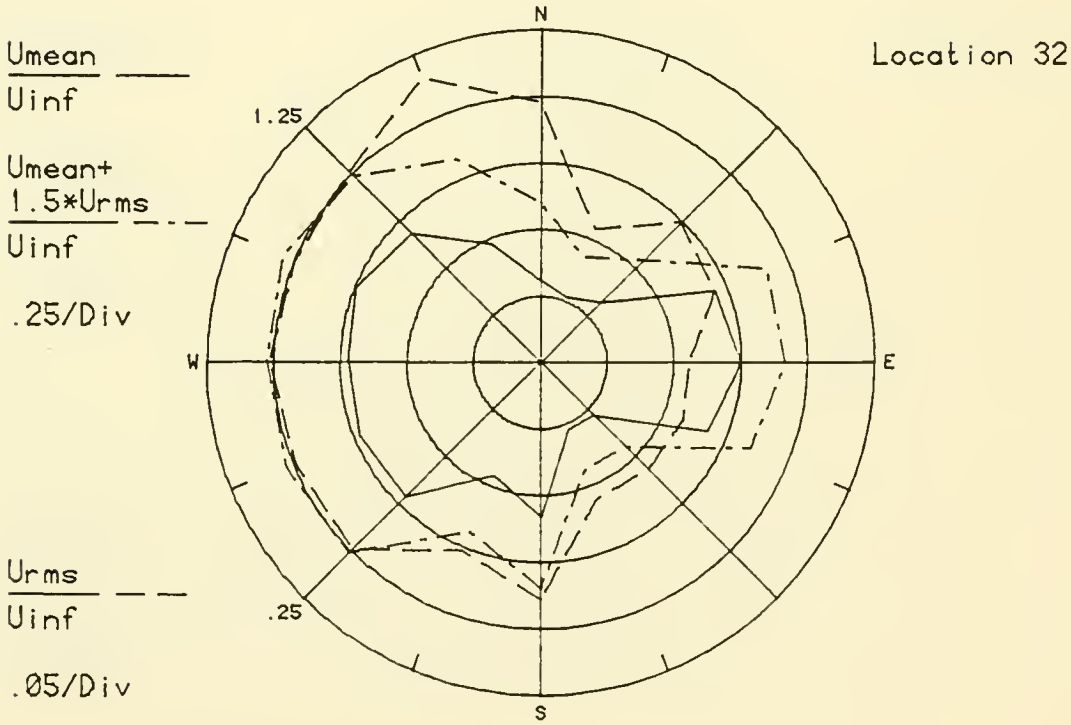

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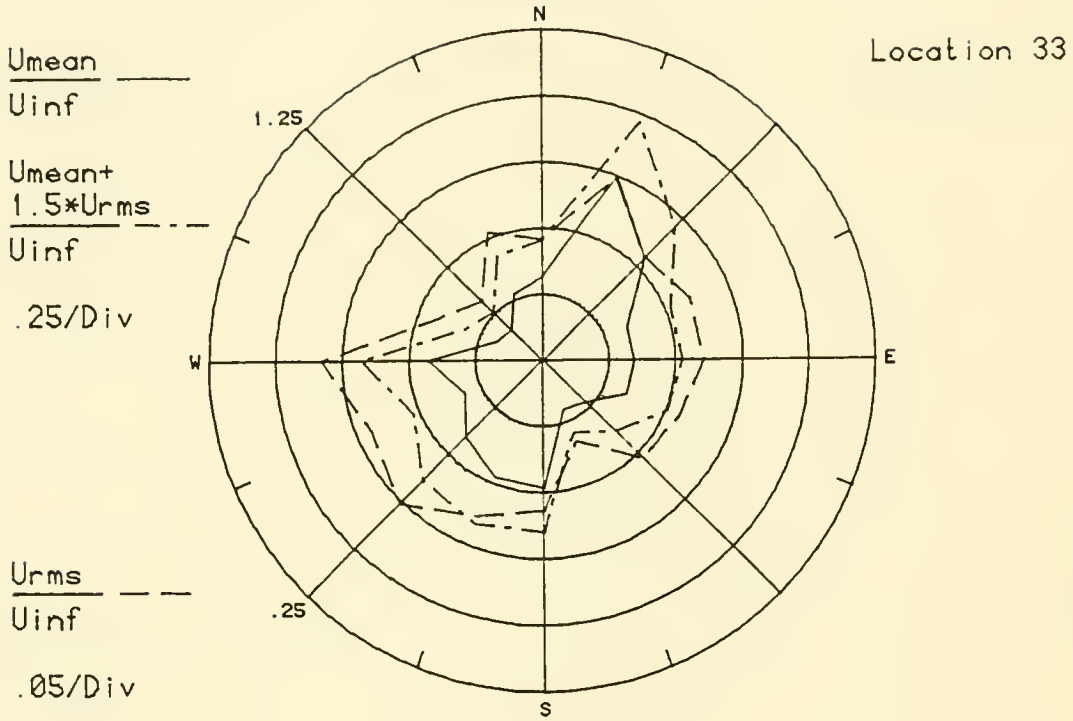

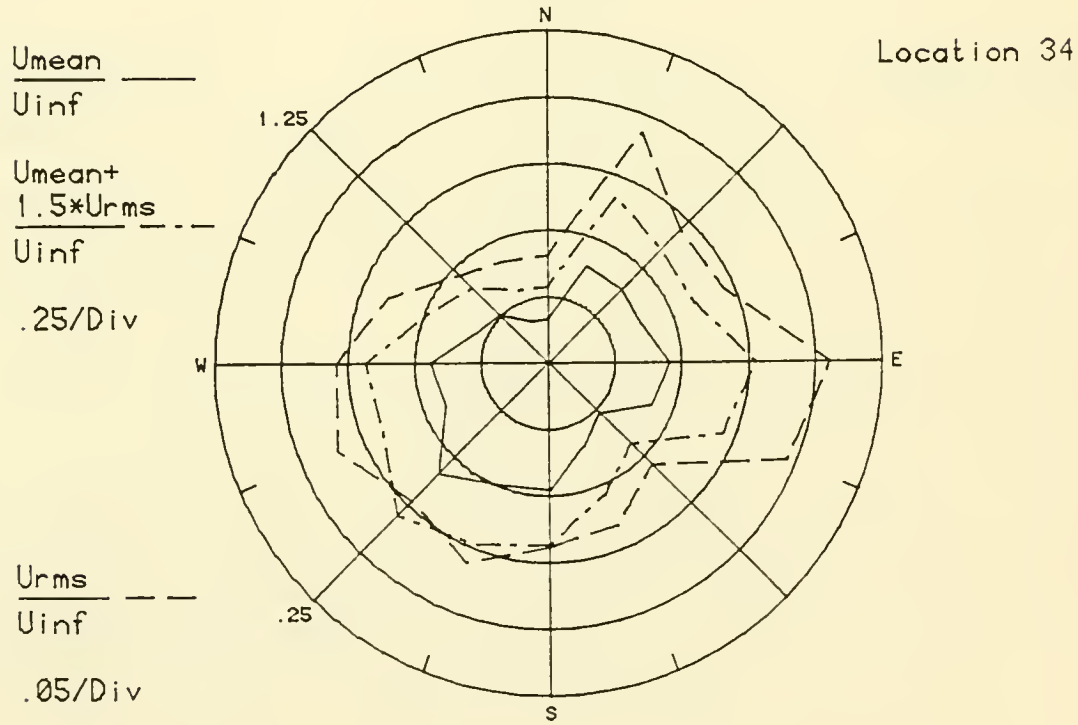

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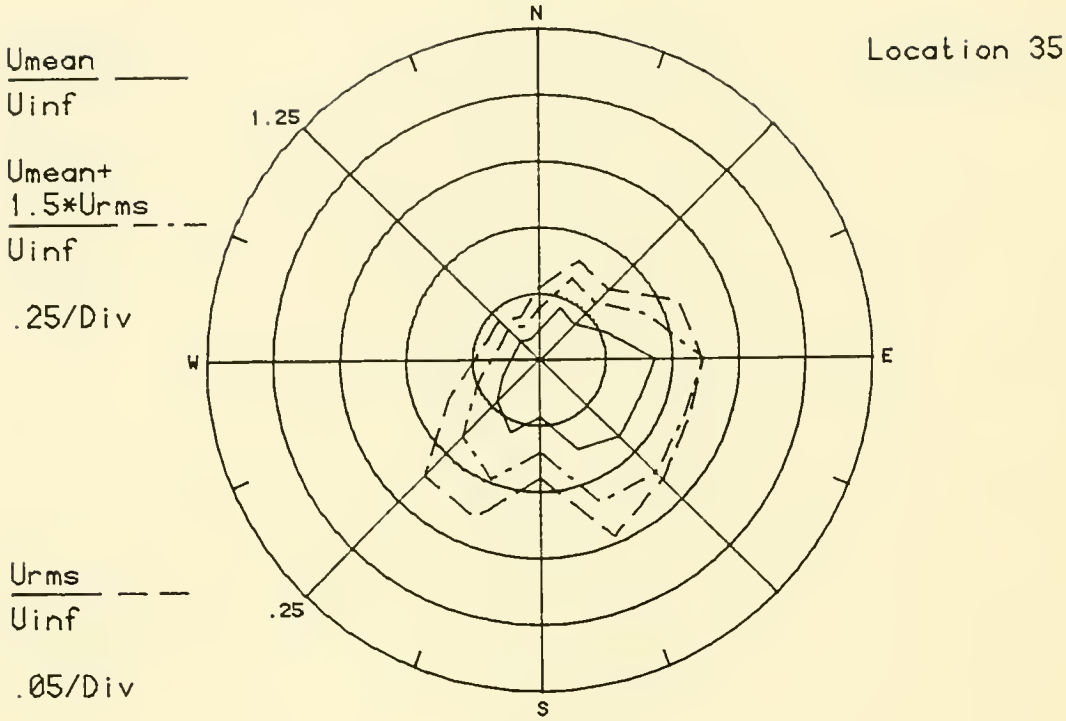

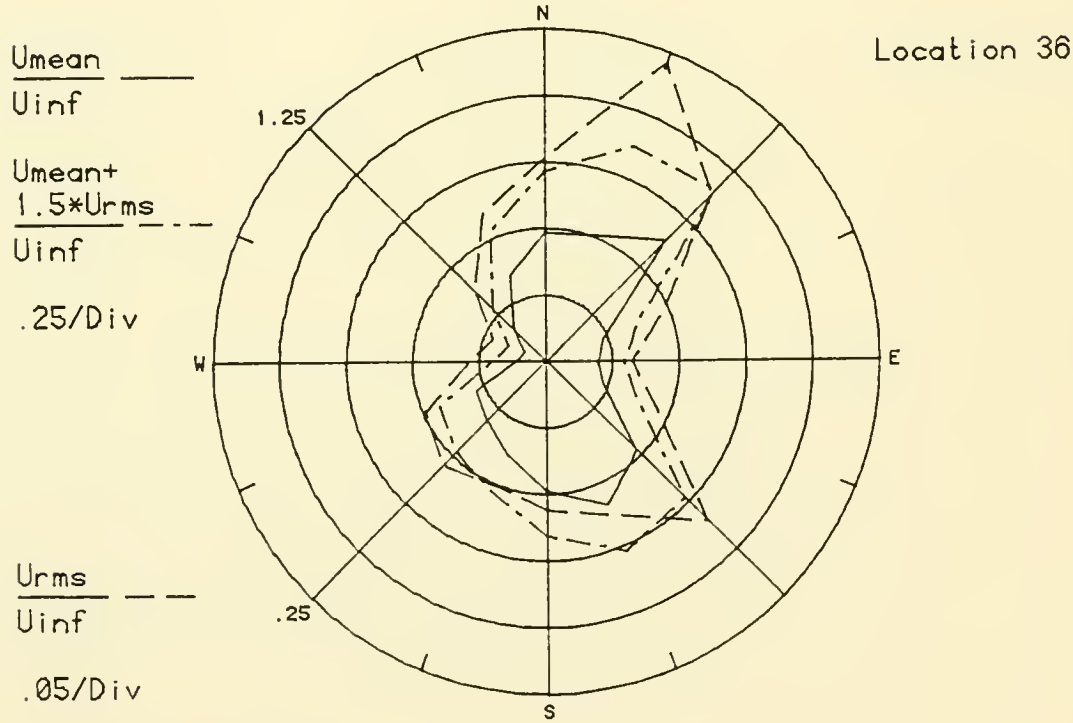

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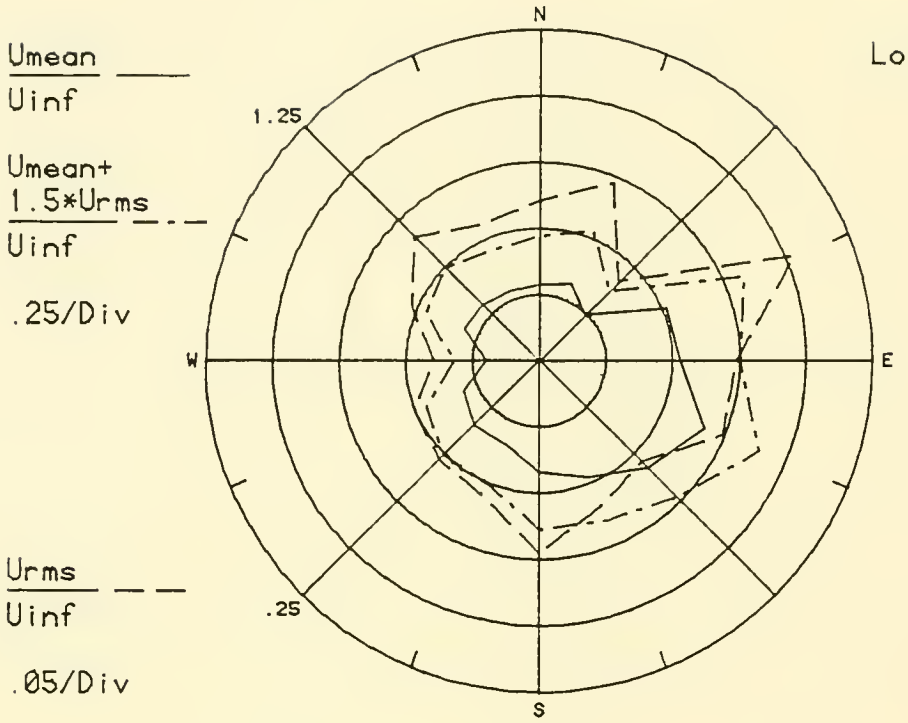

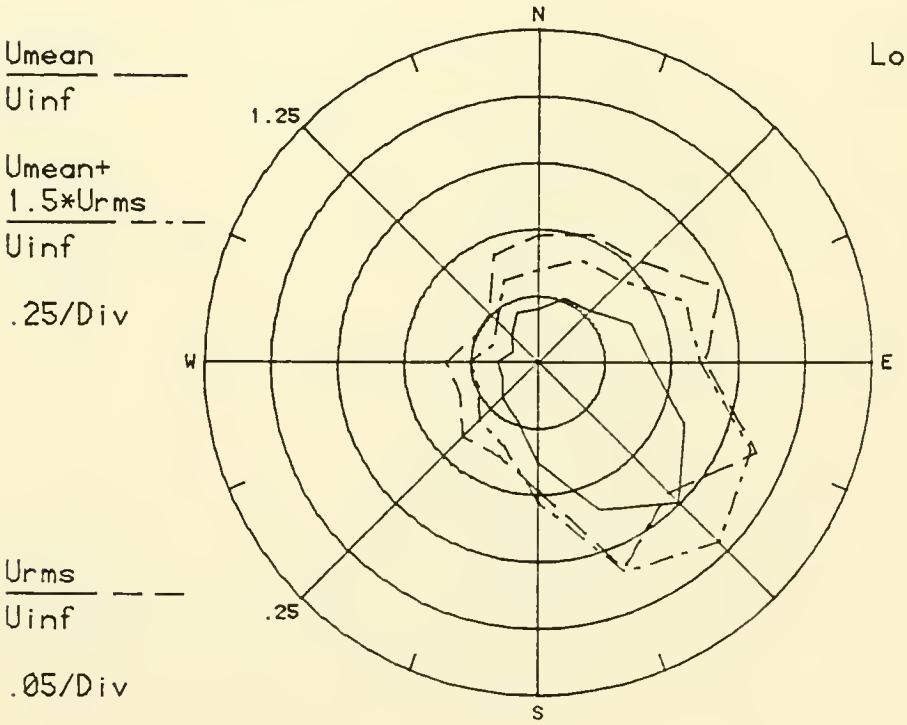

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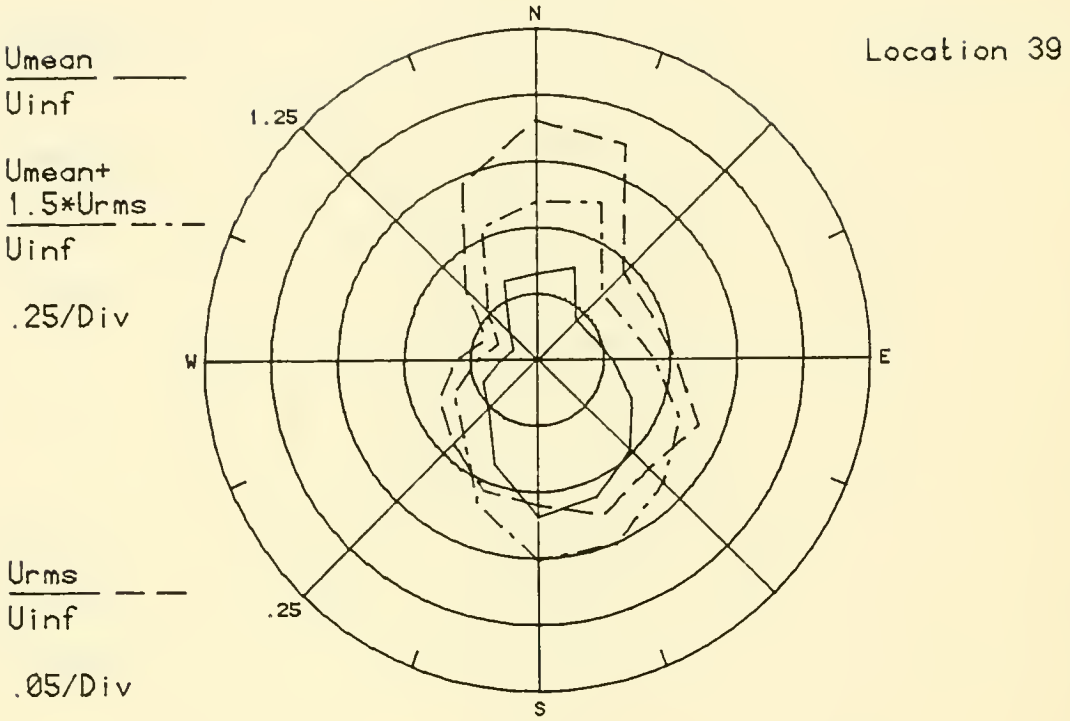

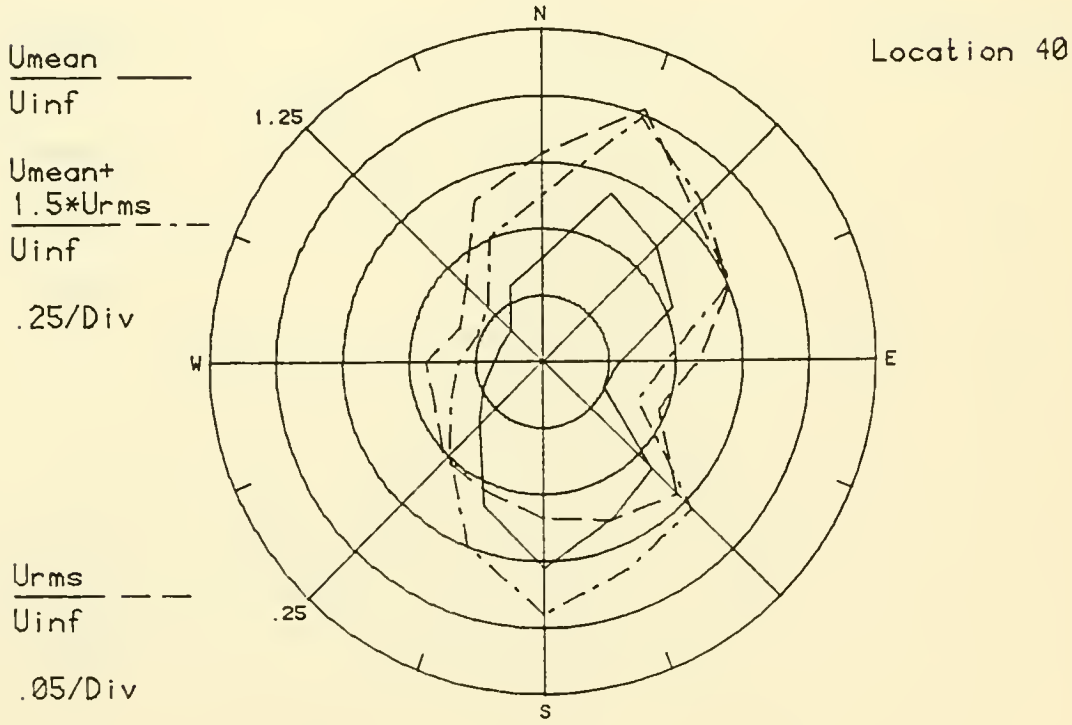

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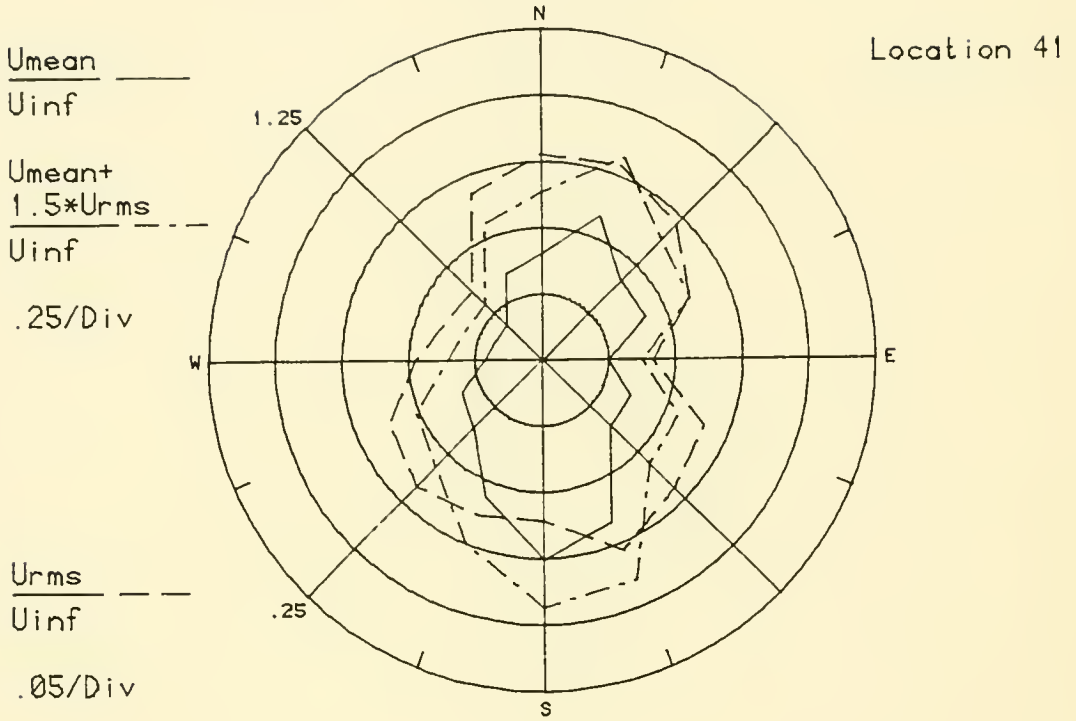

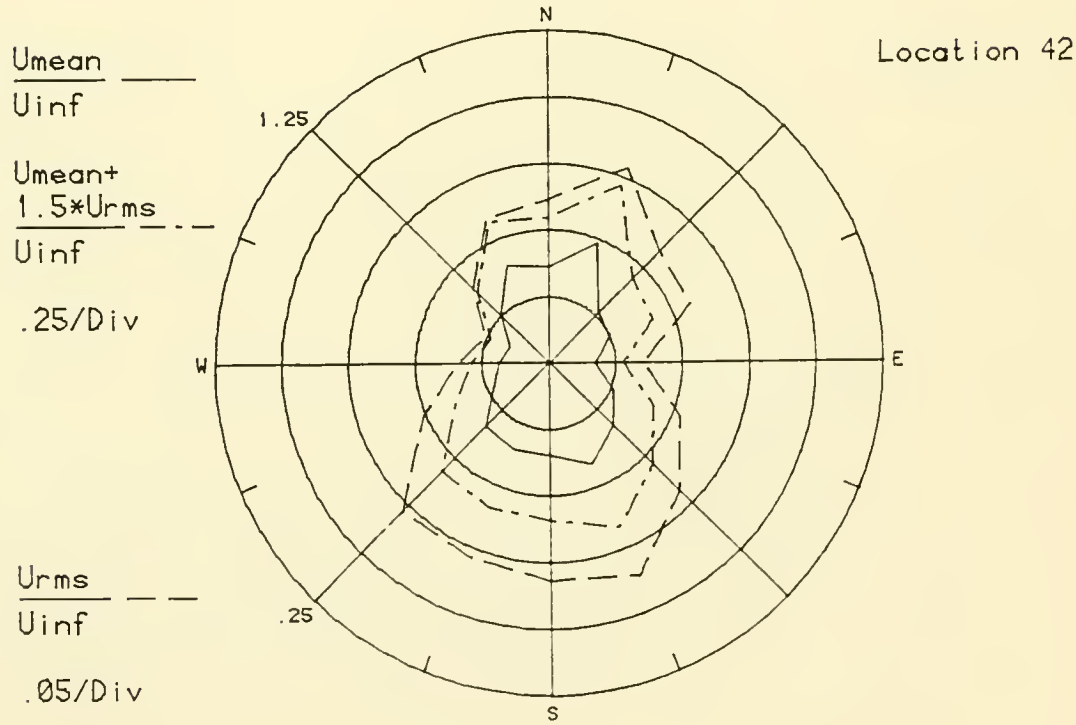

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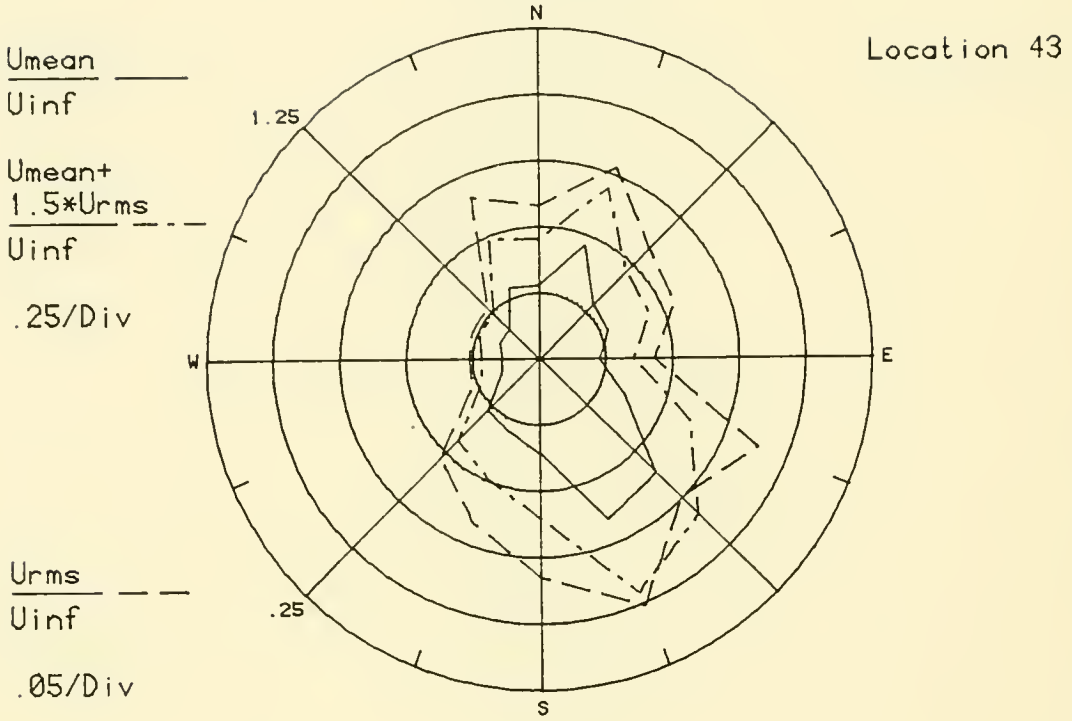

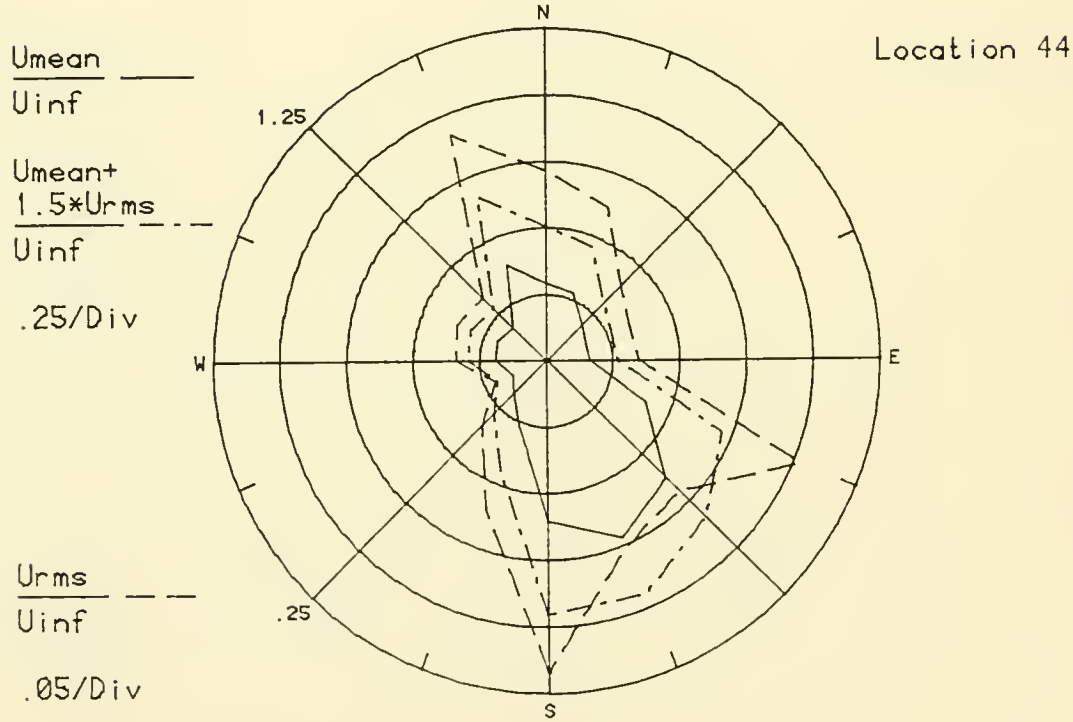

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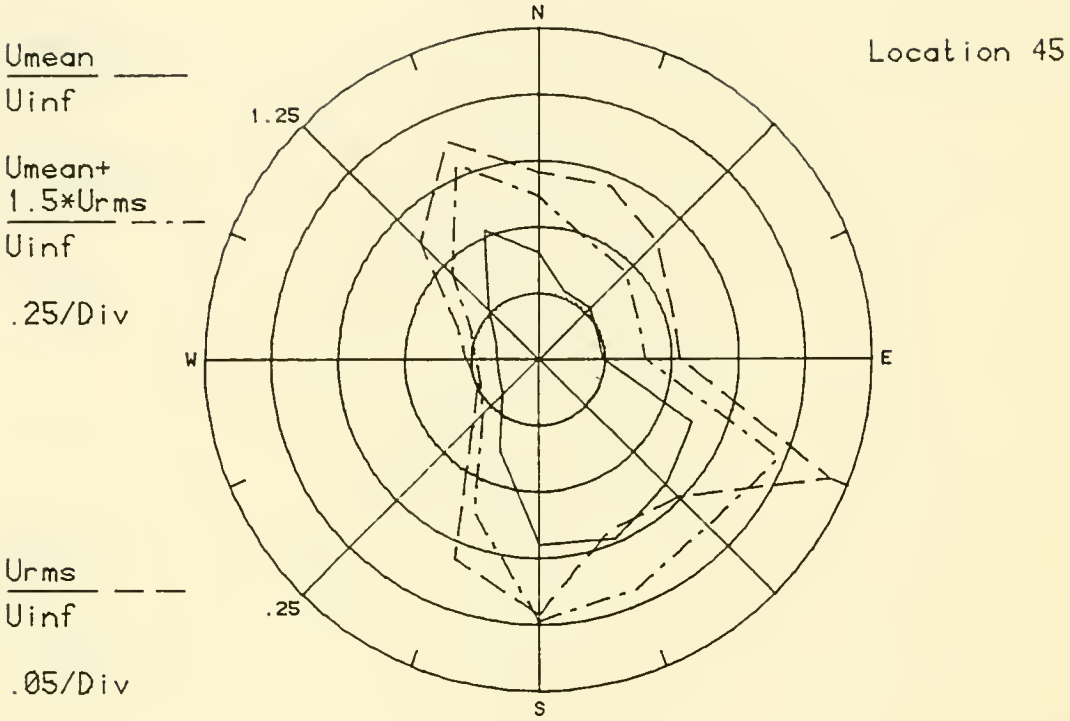

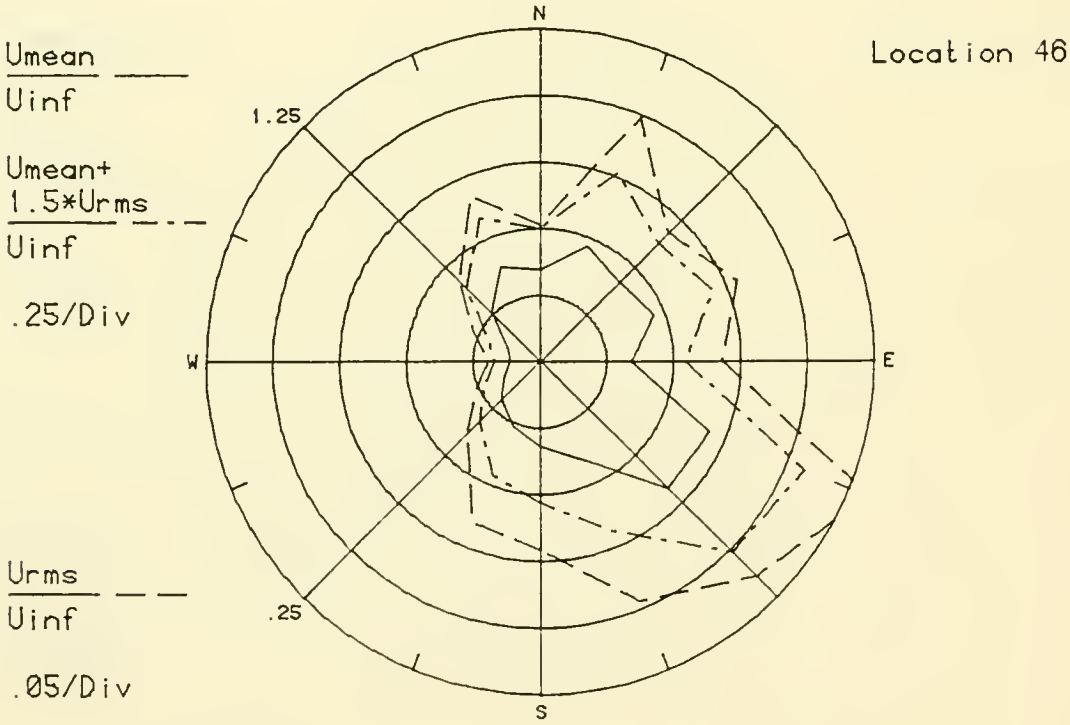

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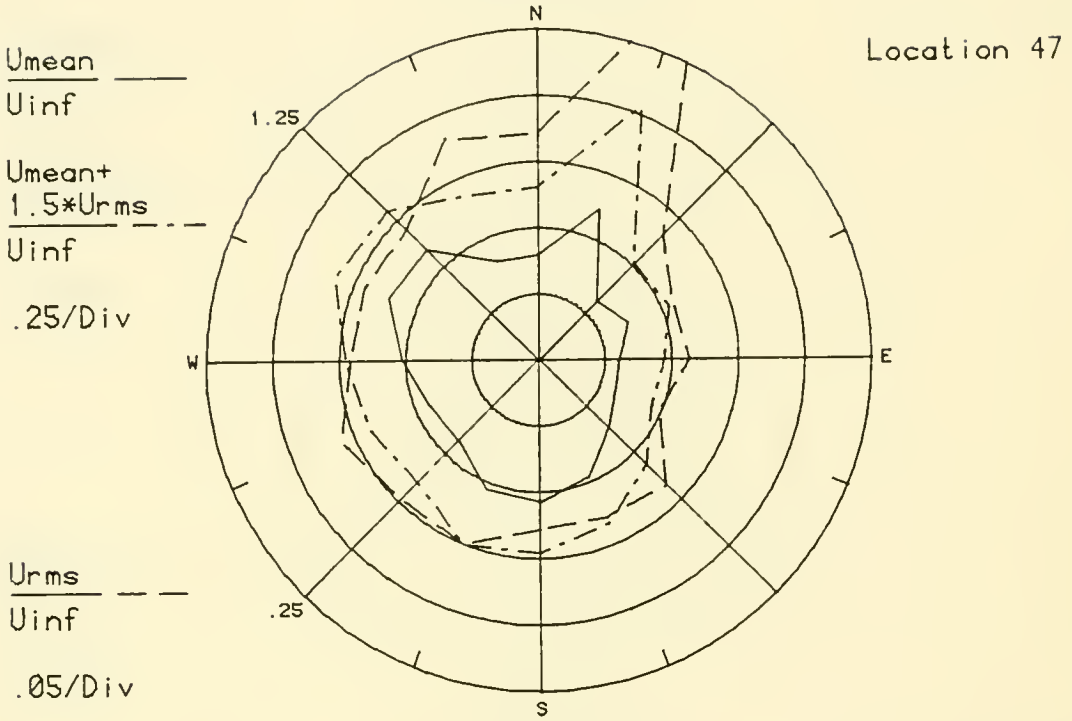

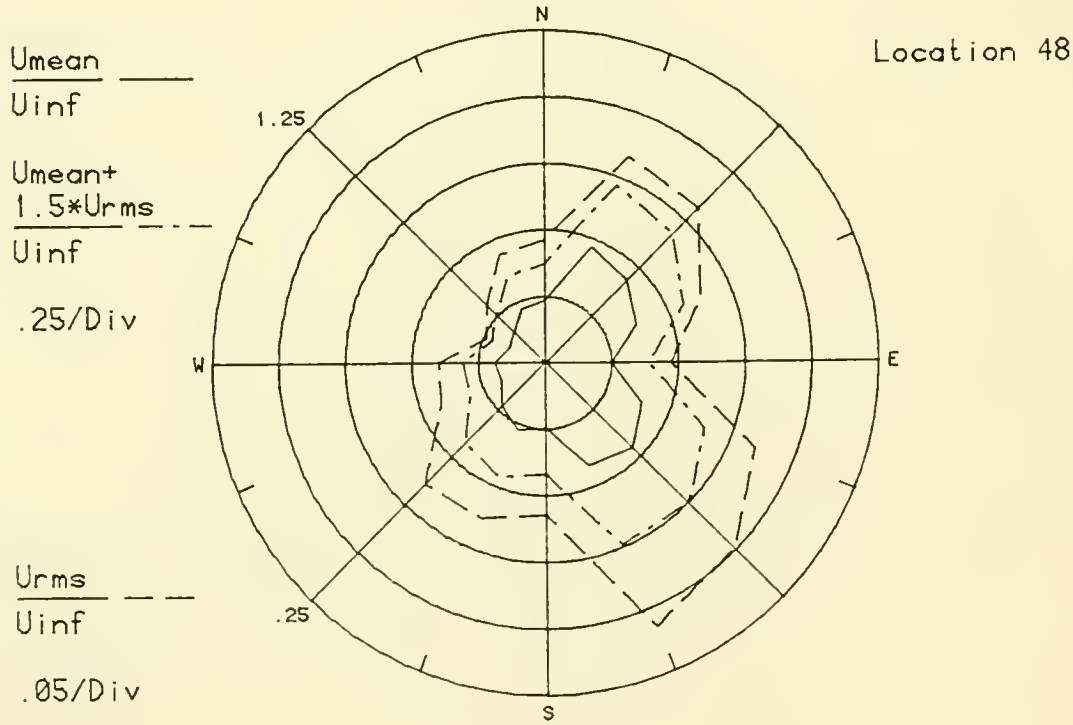

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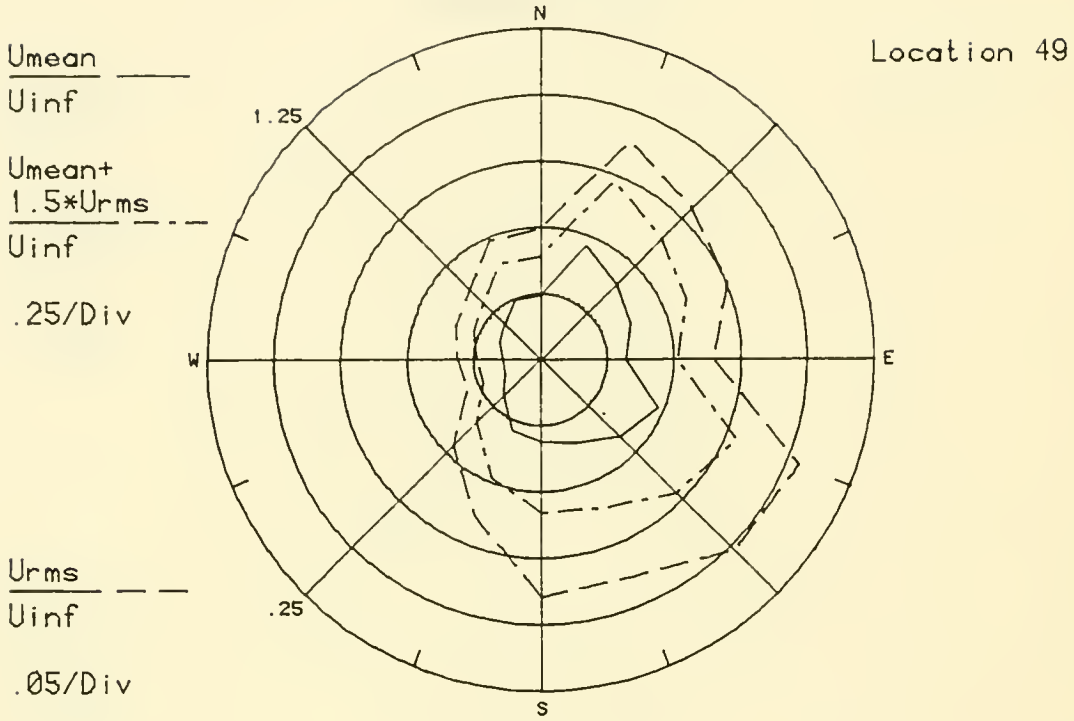

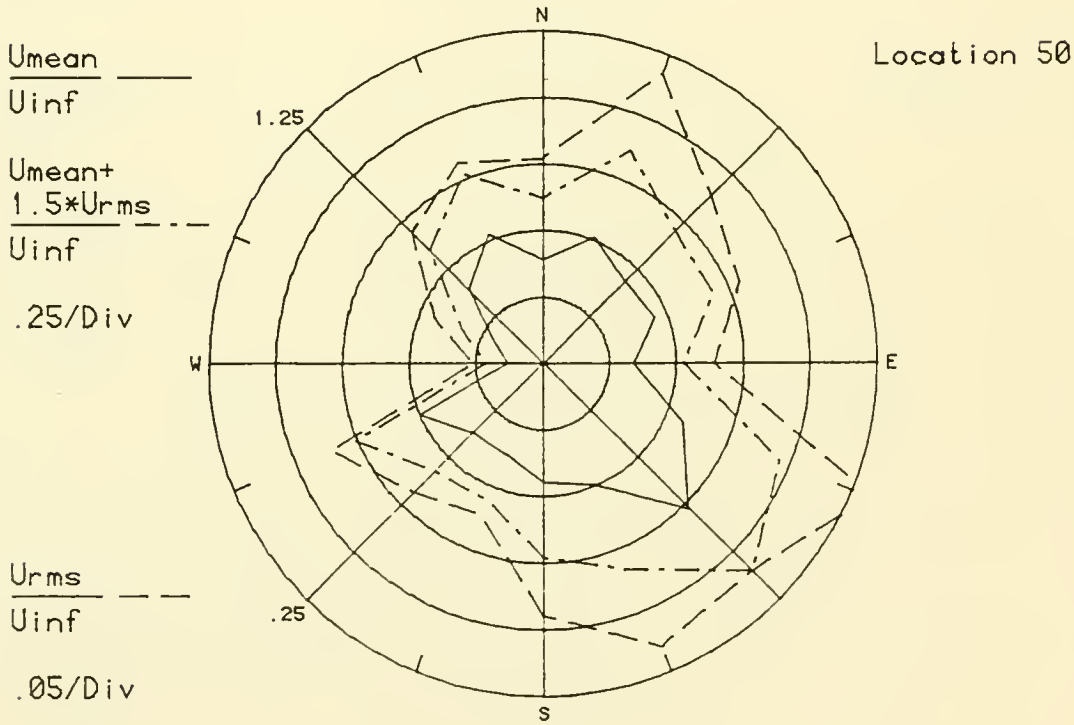

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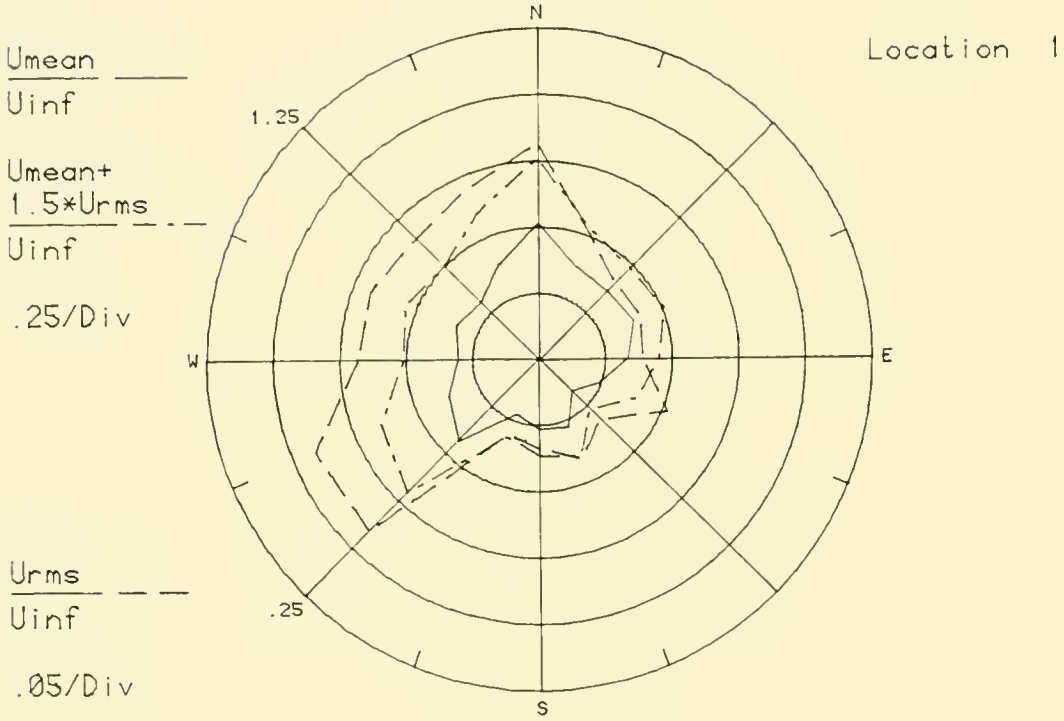

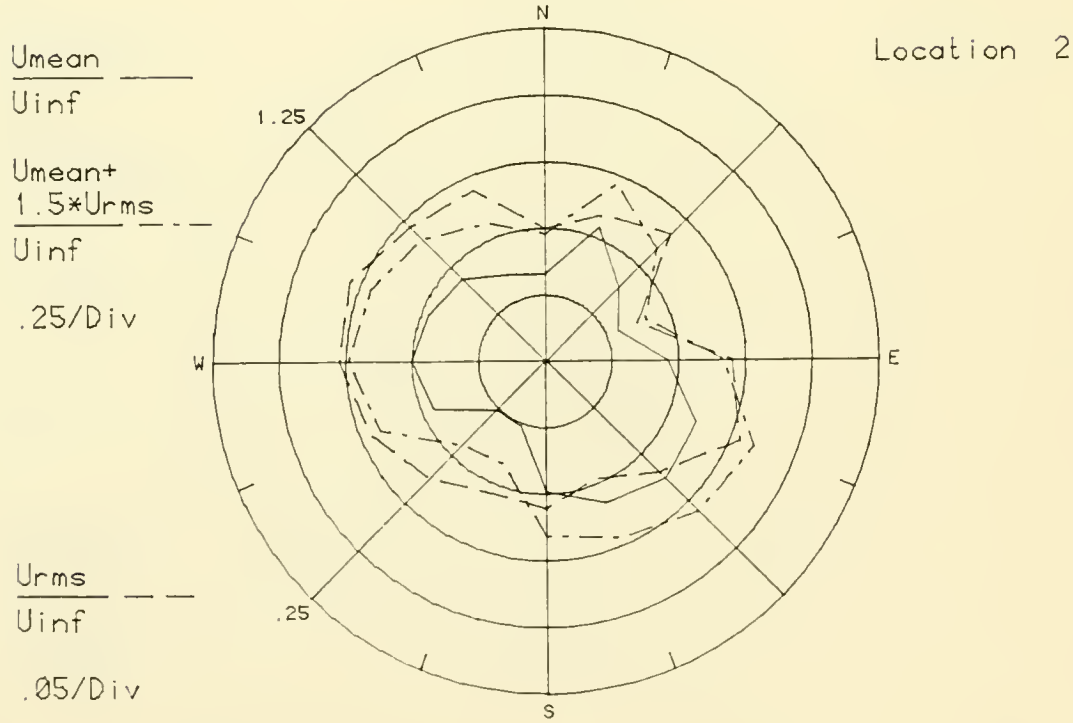

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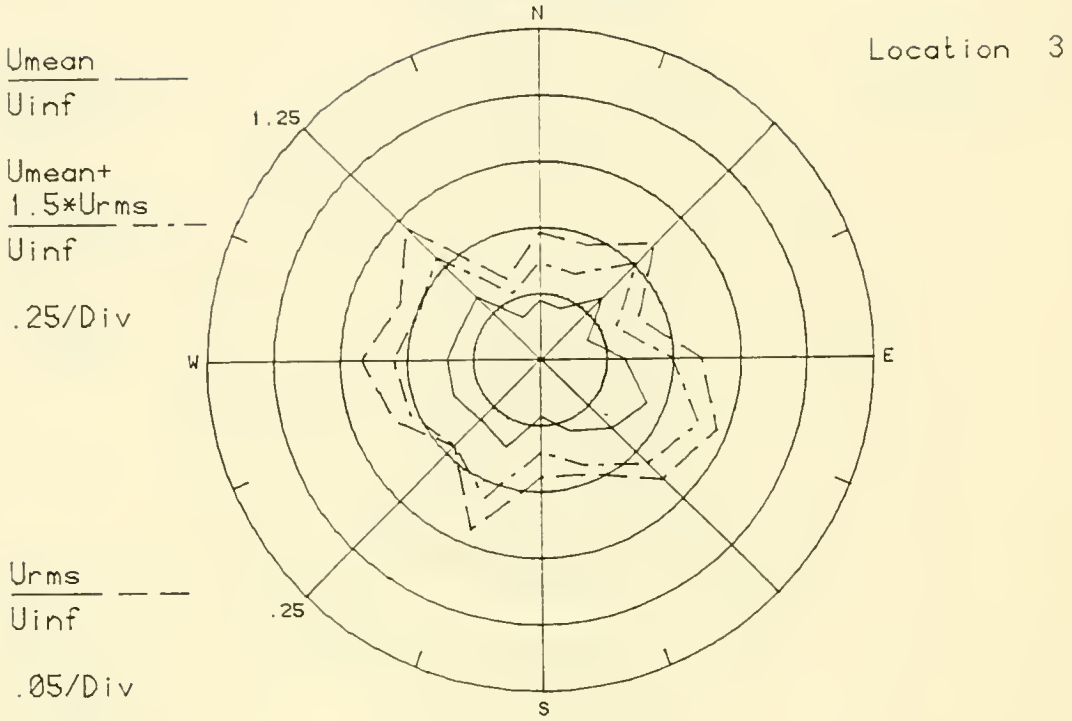

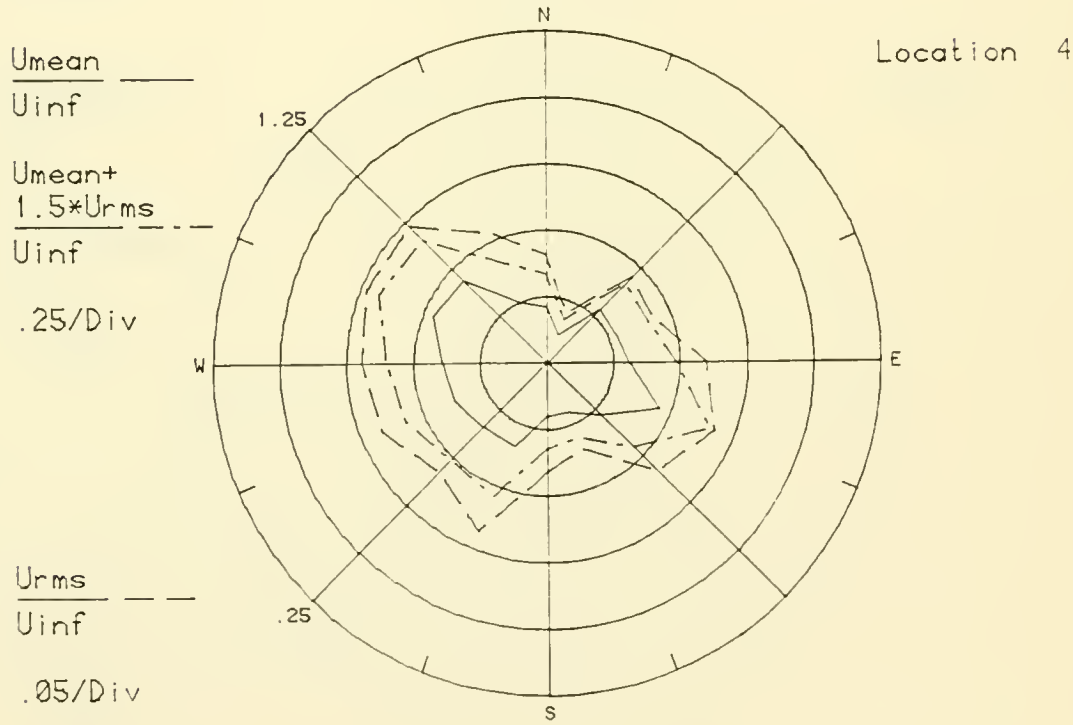

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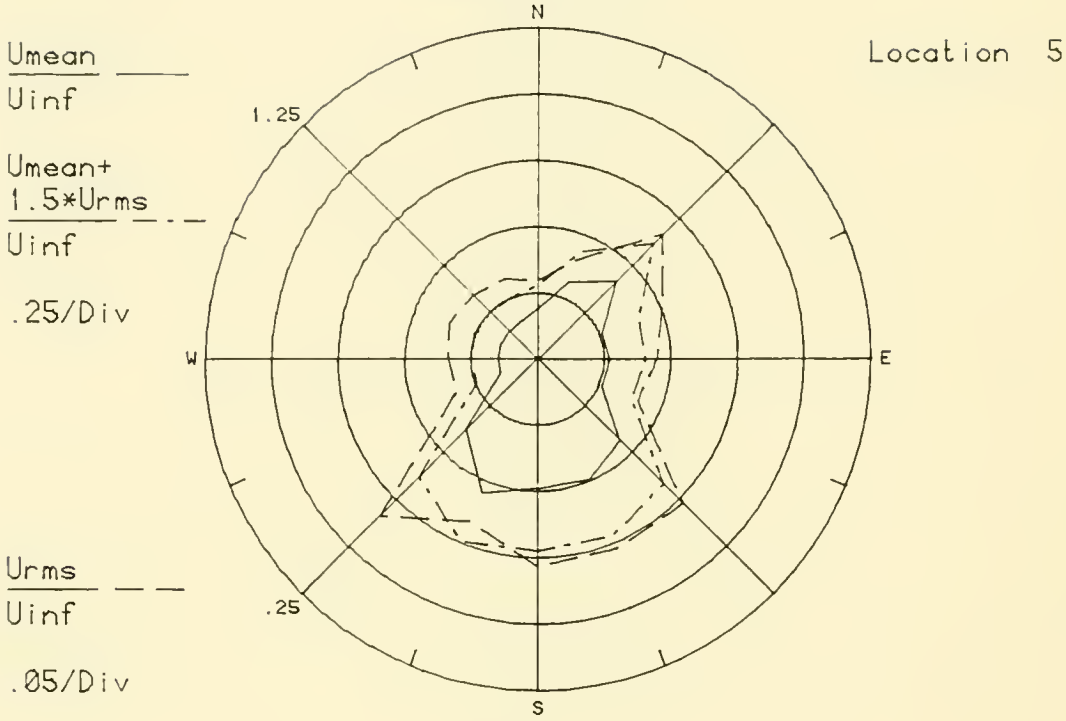

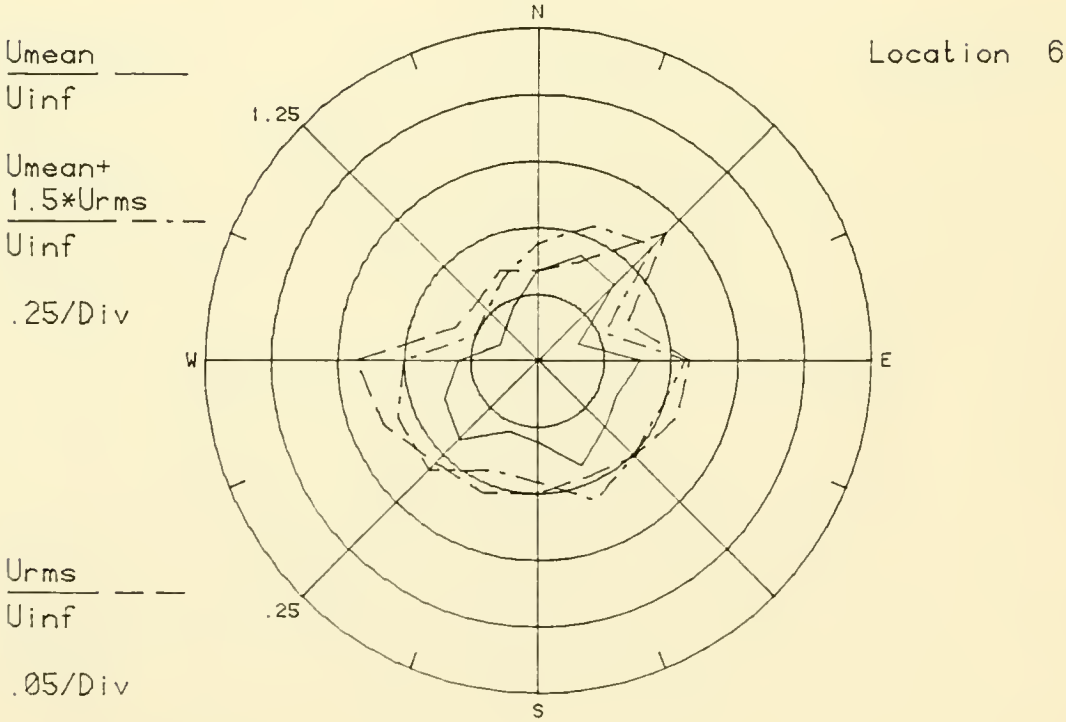

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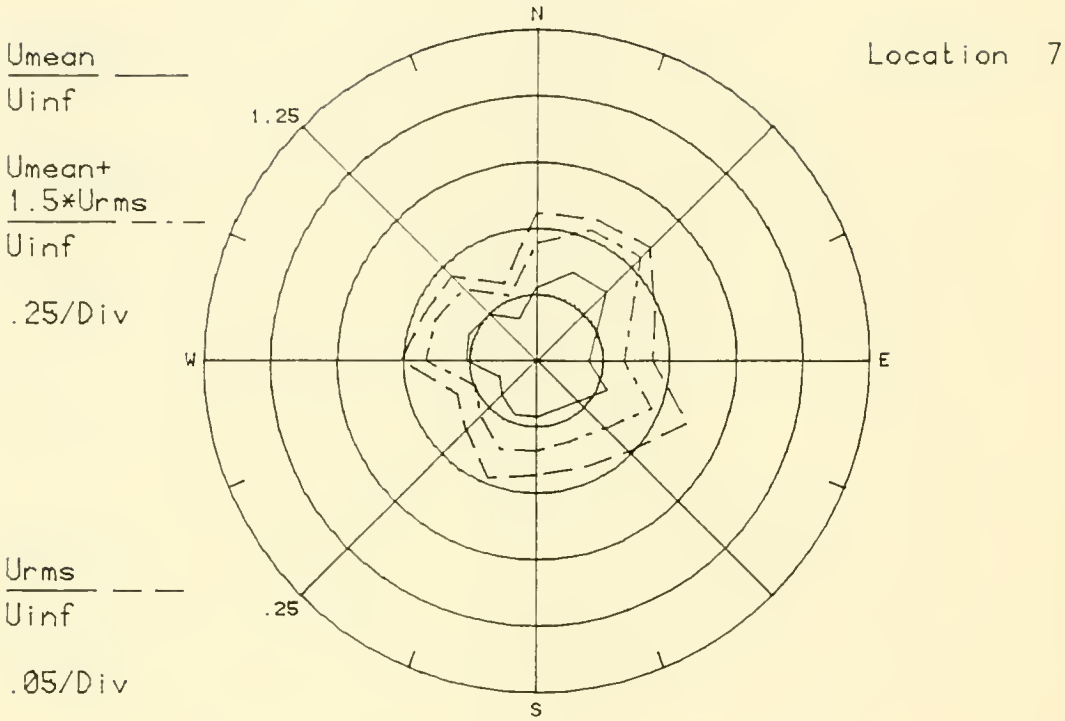

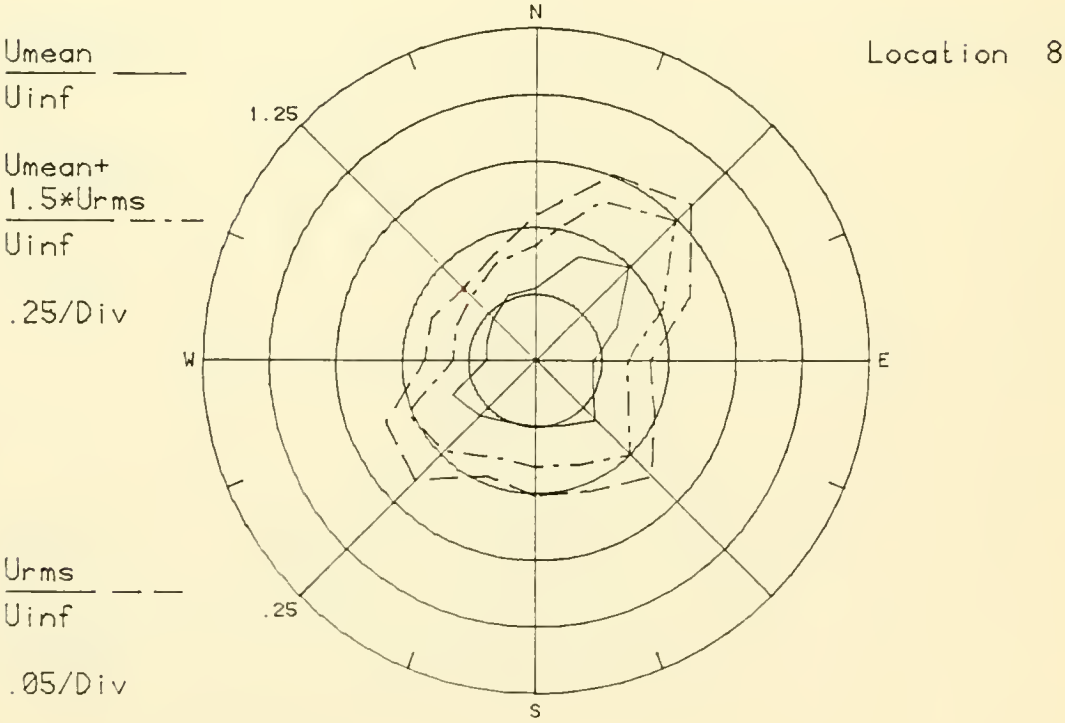

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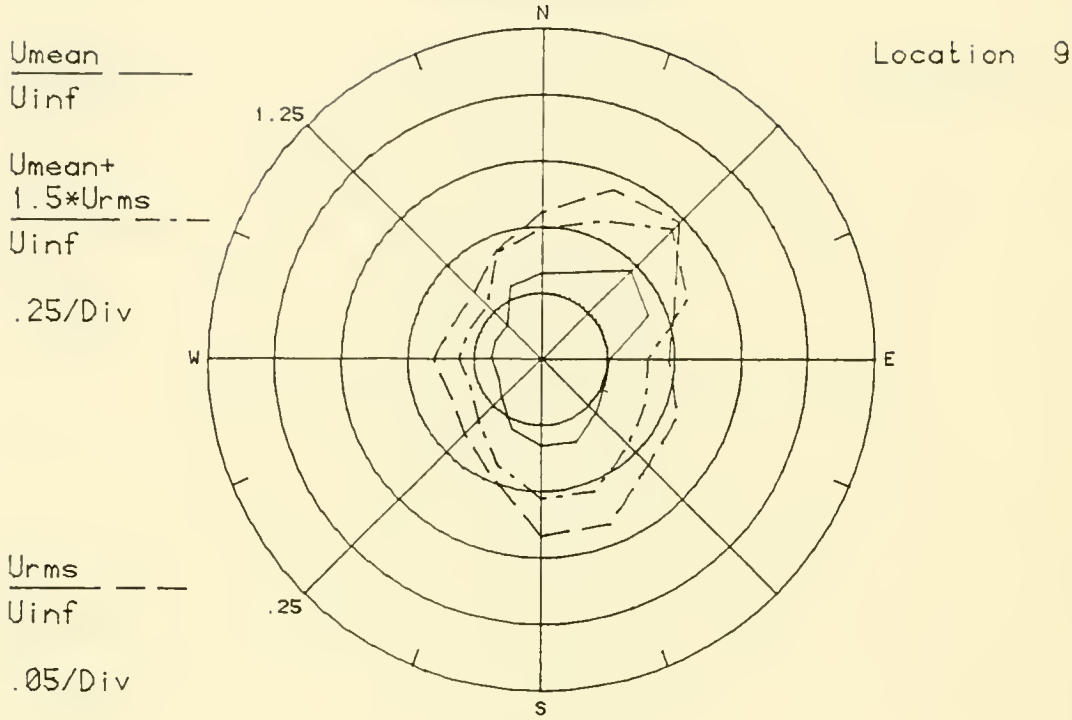

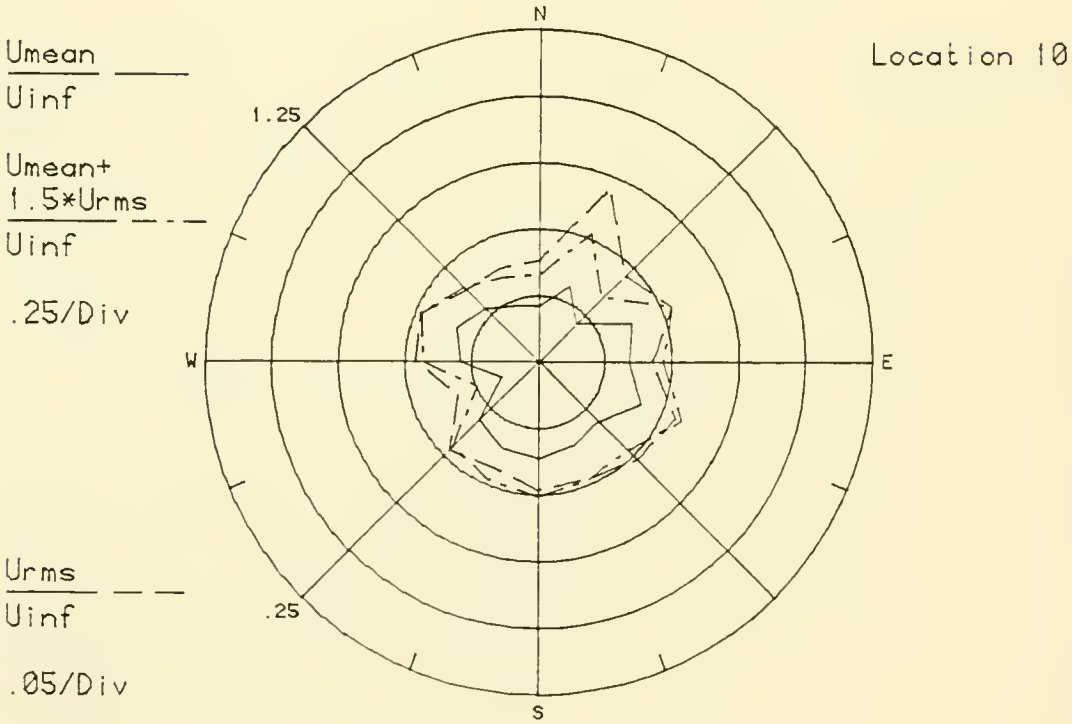

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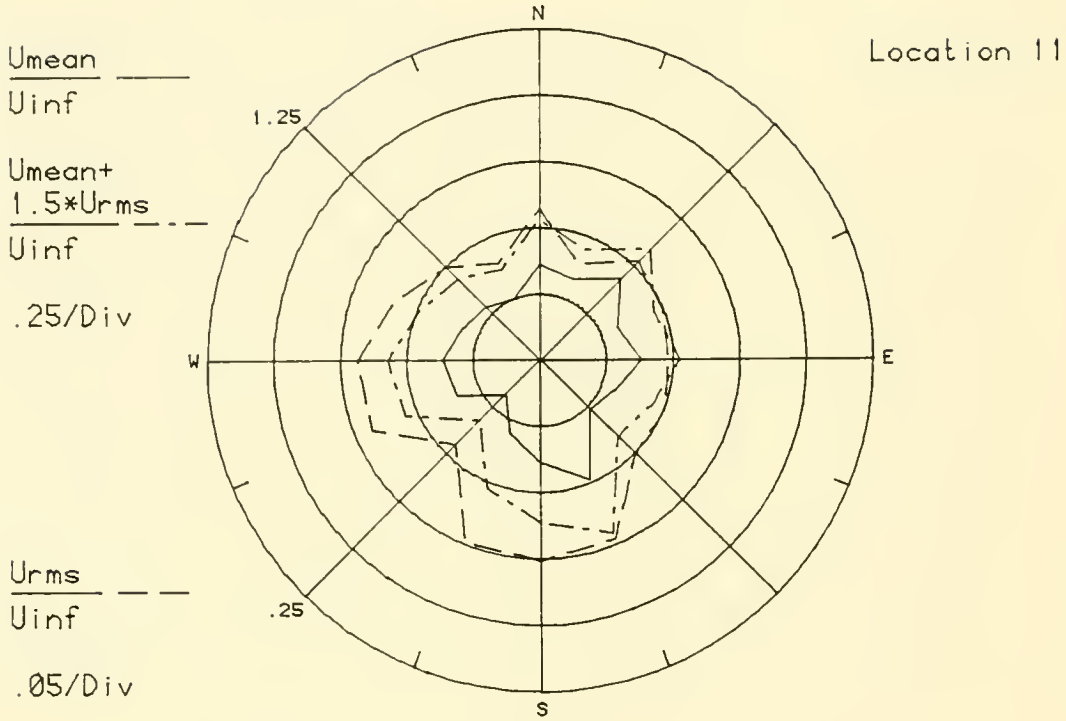

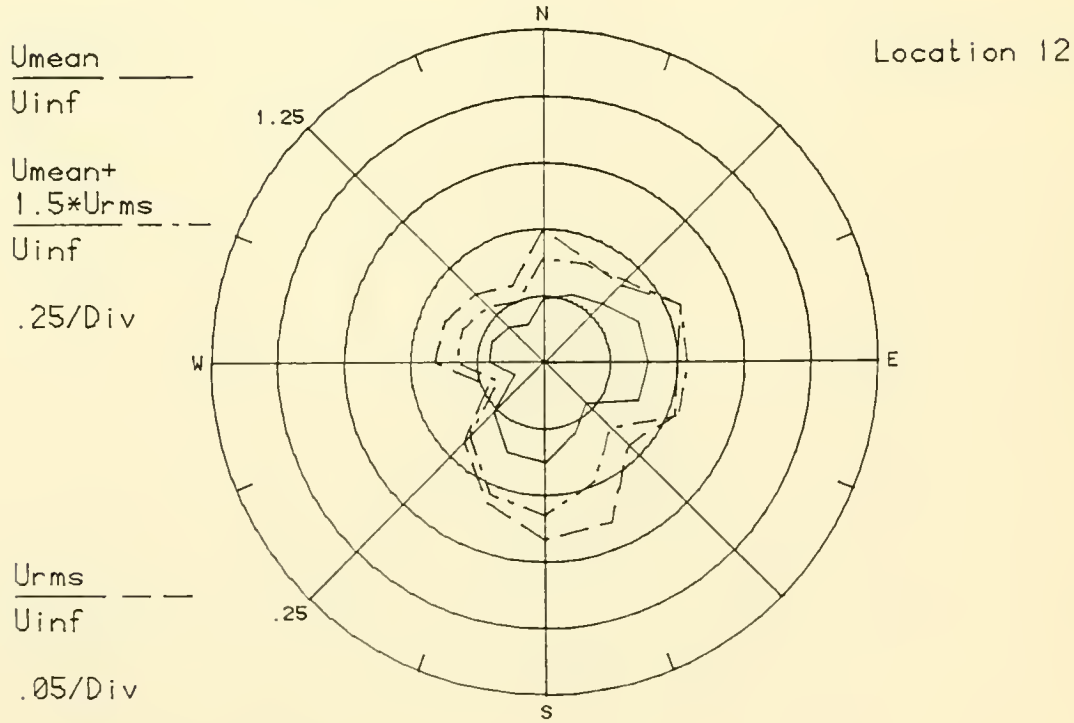

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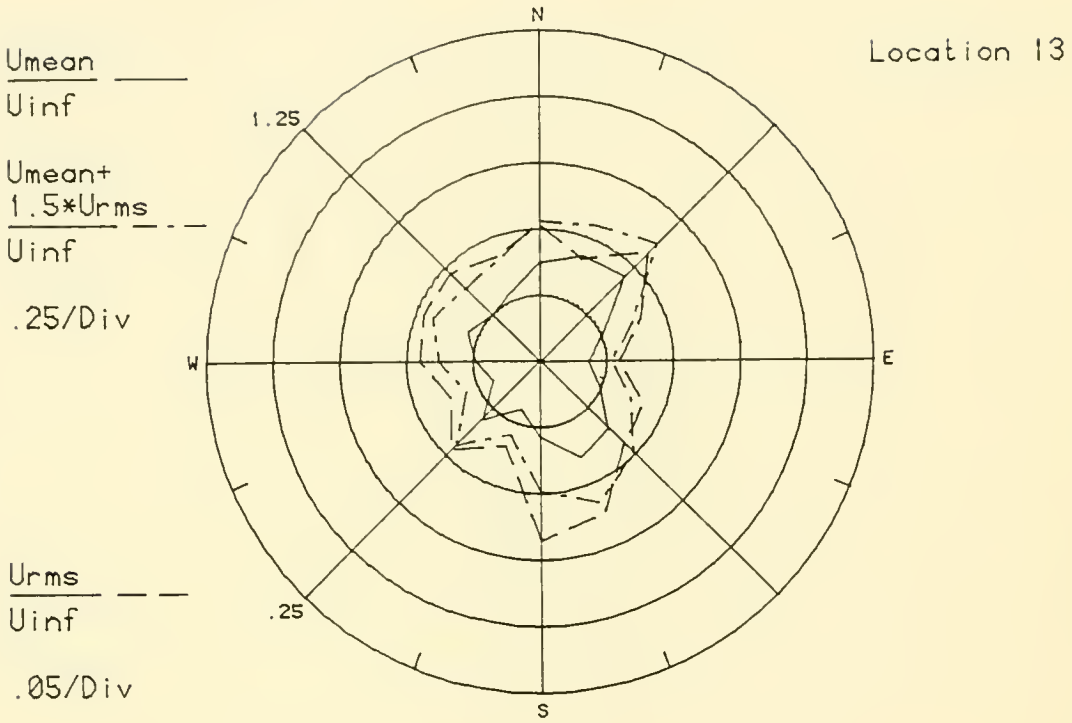
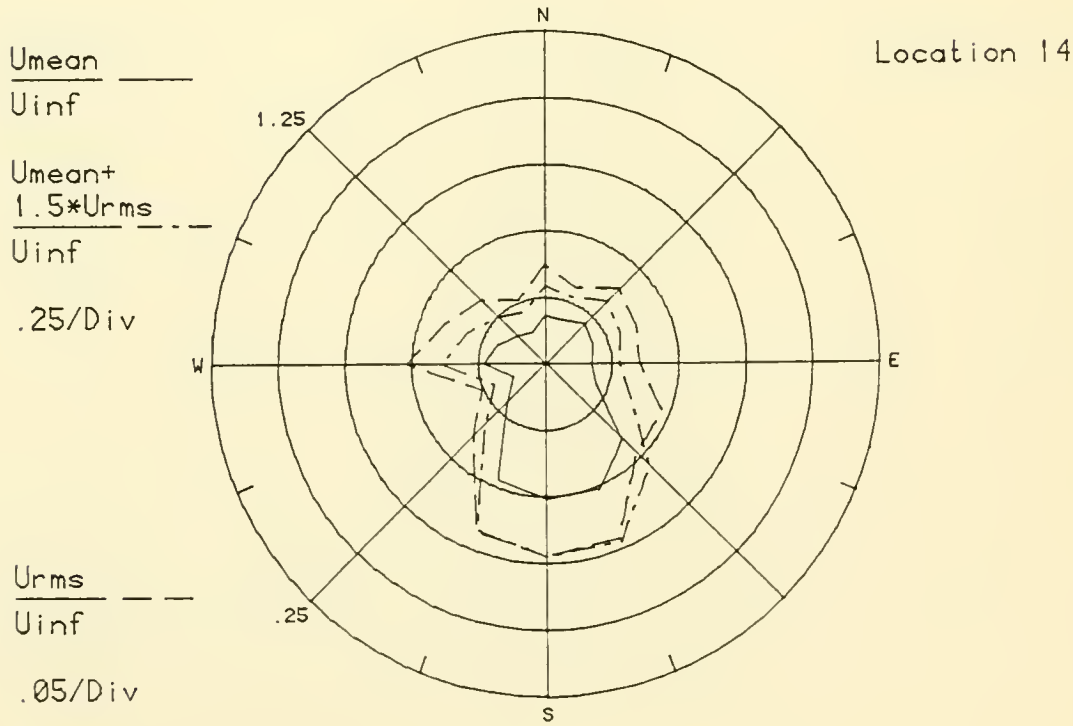
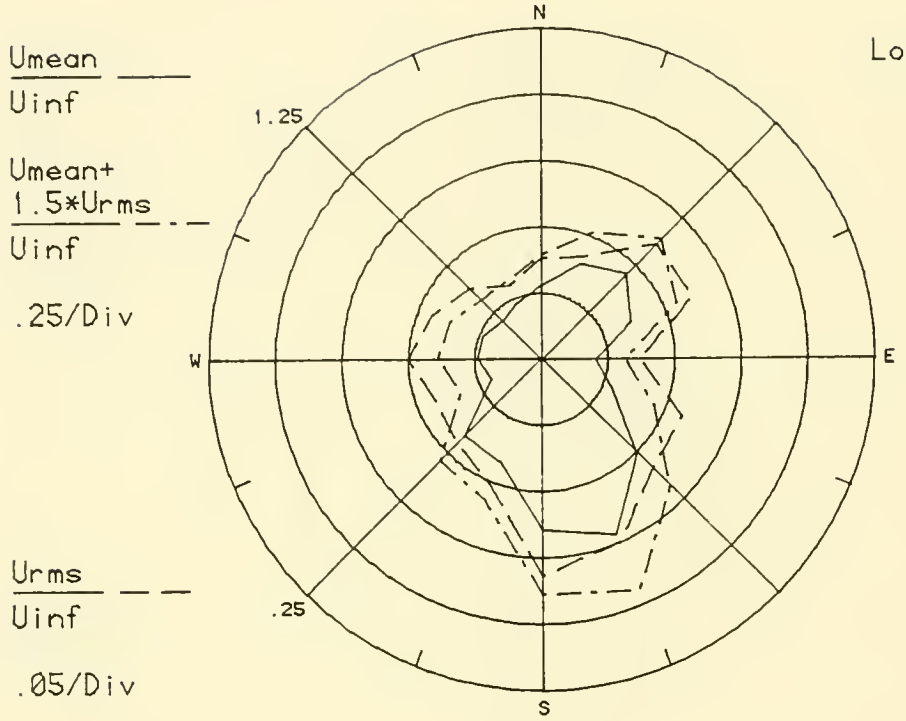
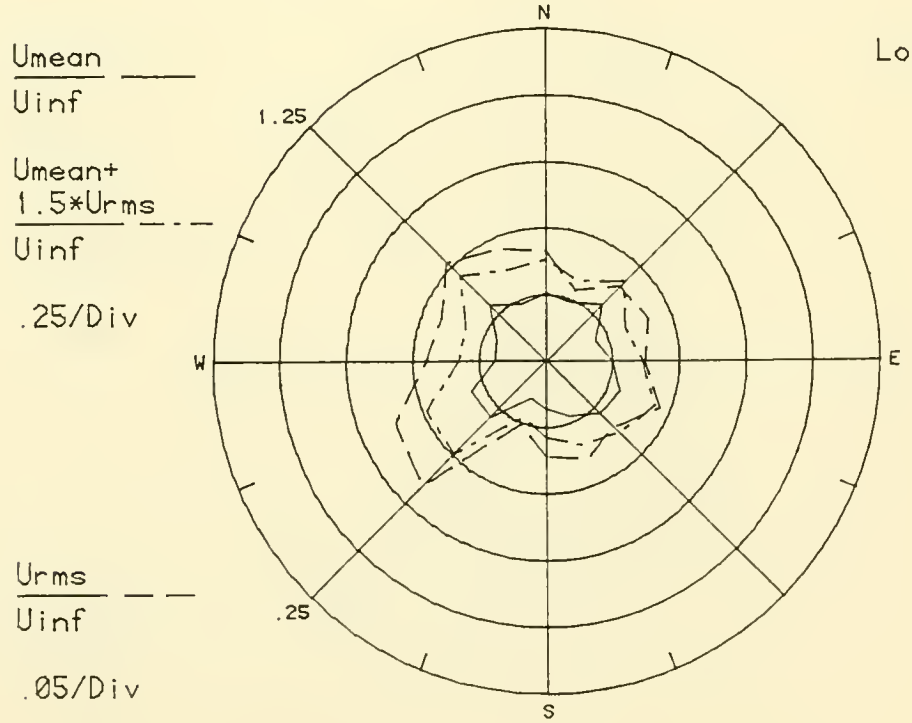




Configuration PH 2





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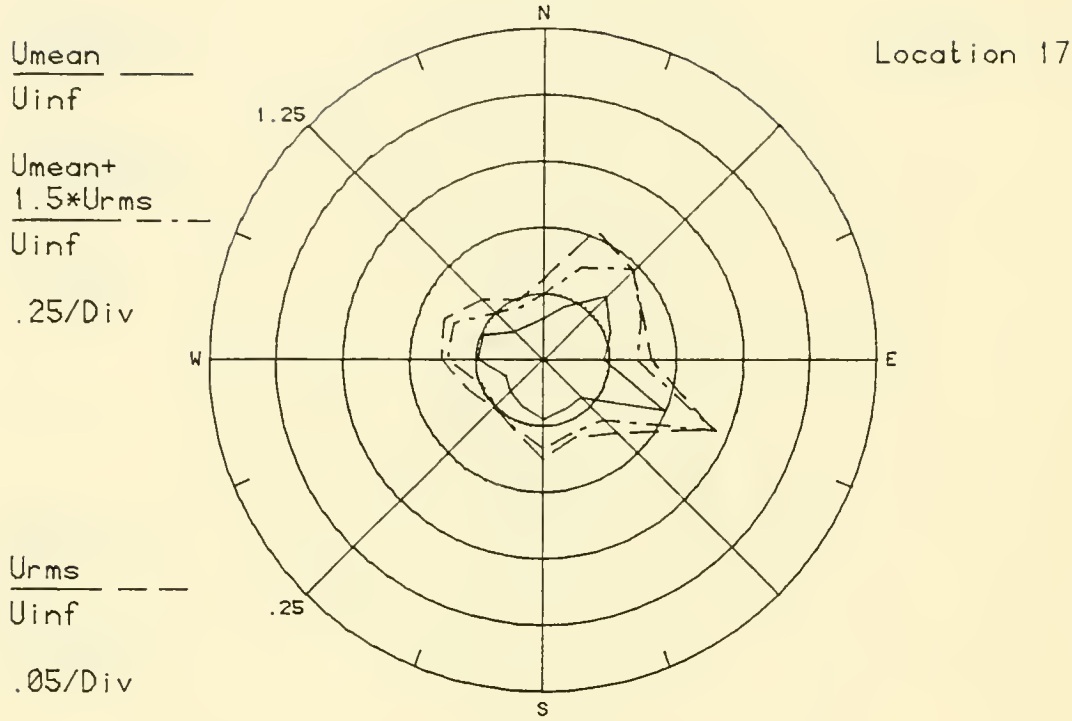

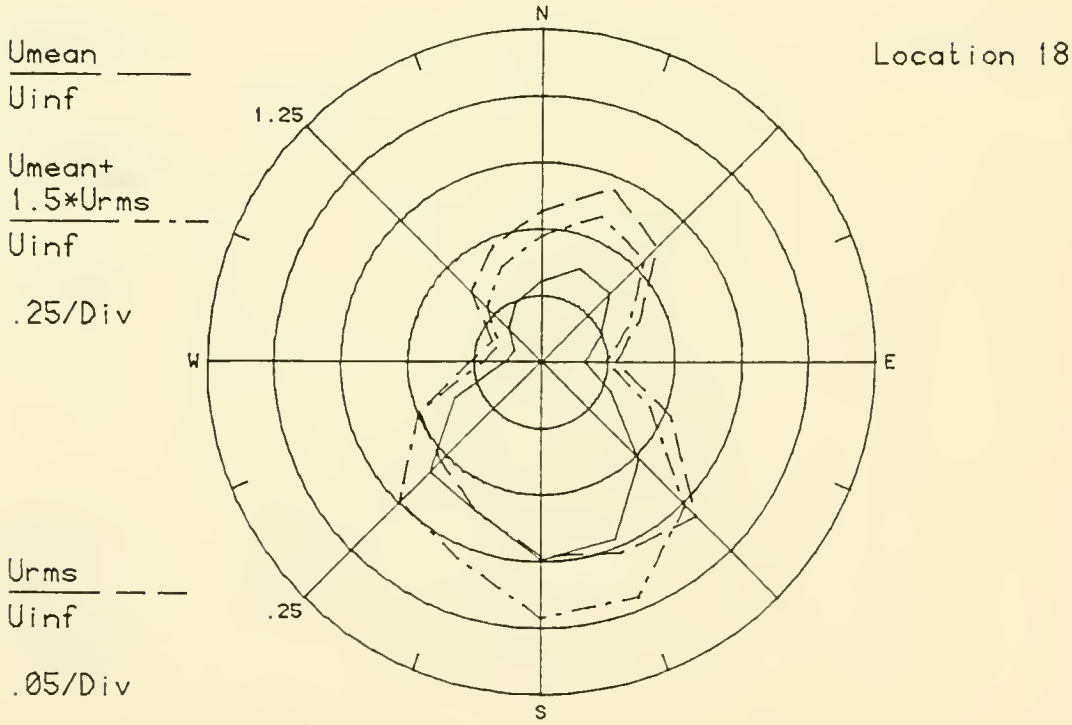

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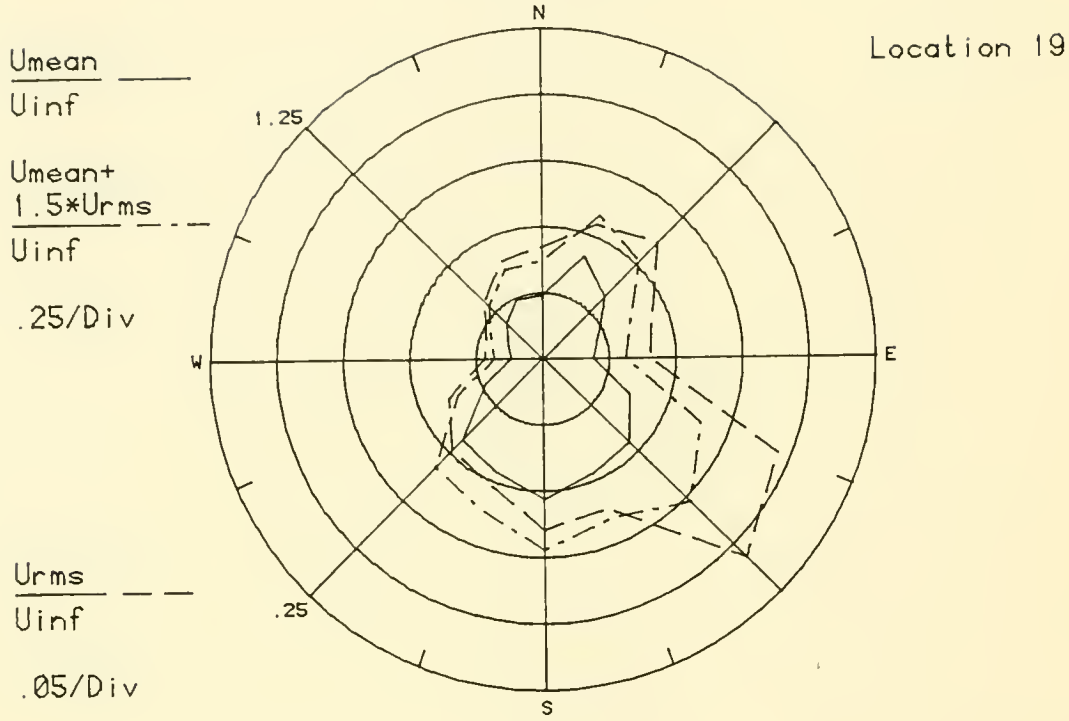

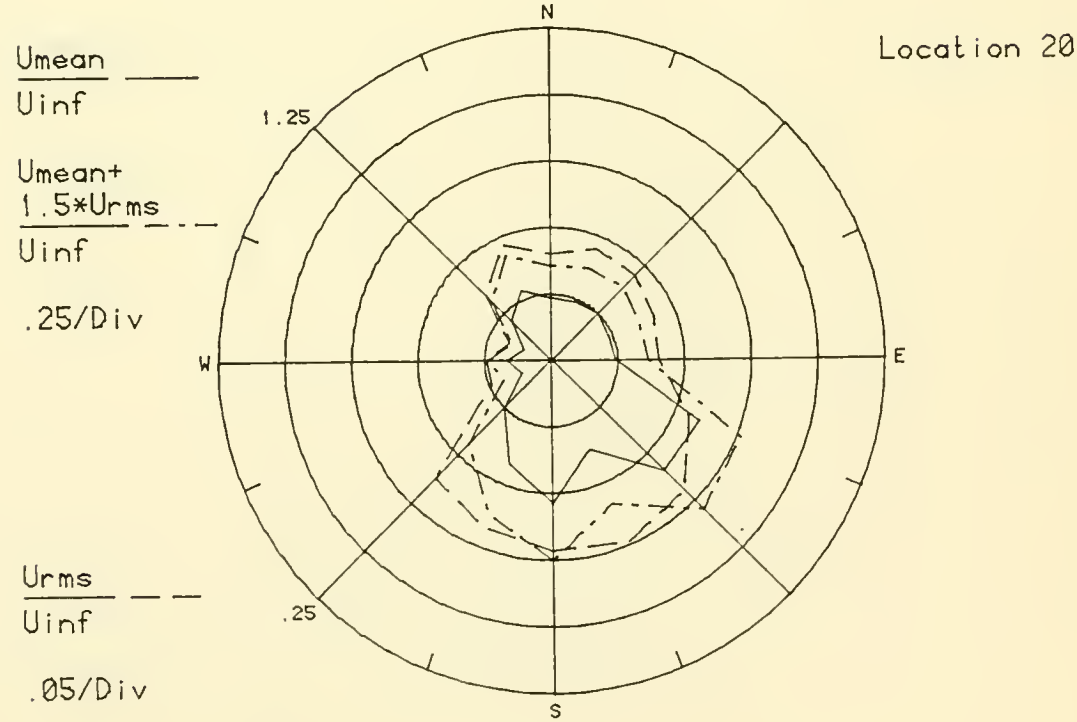

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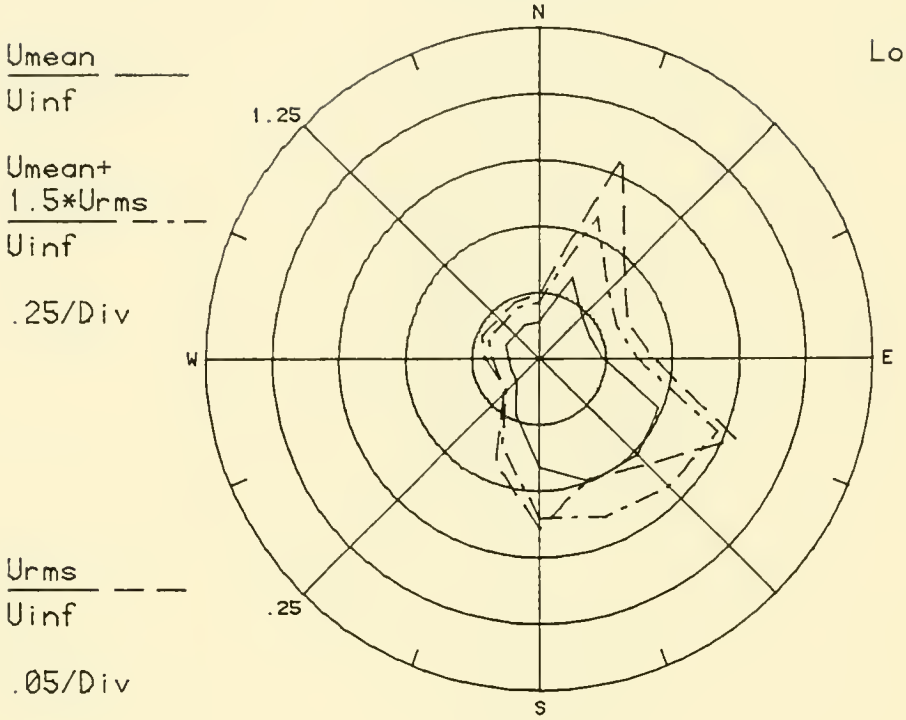

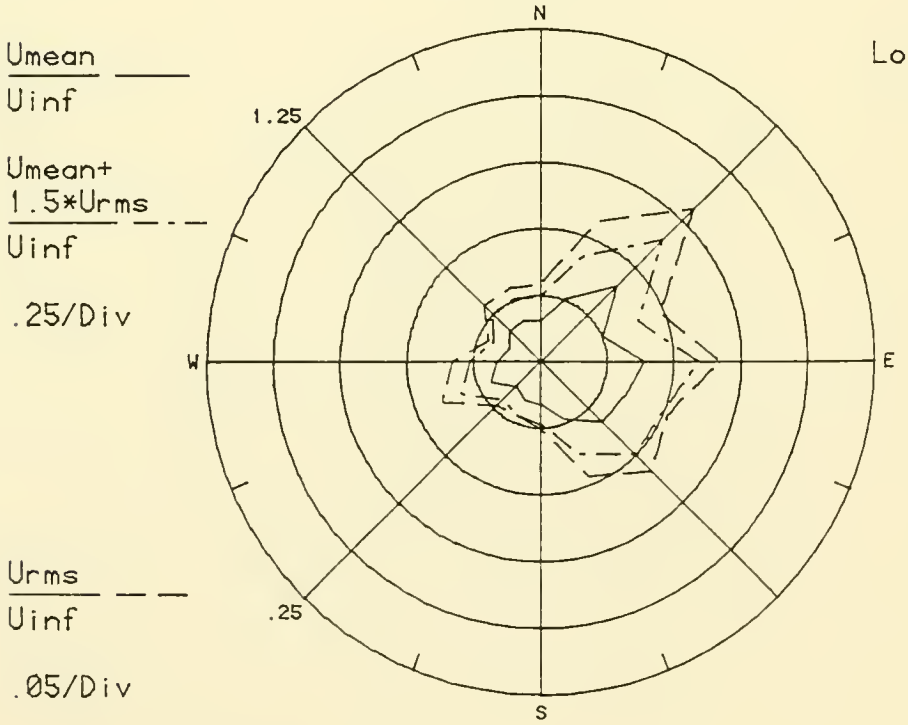

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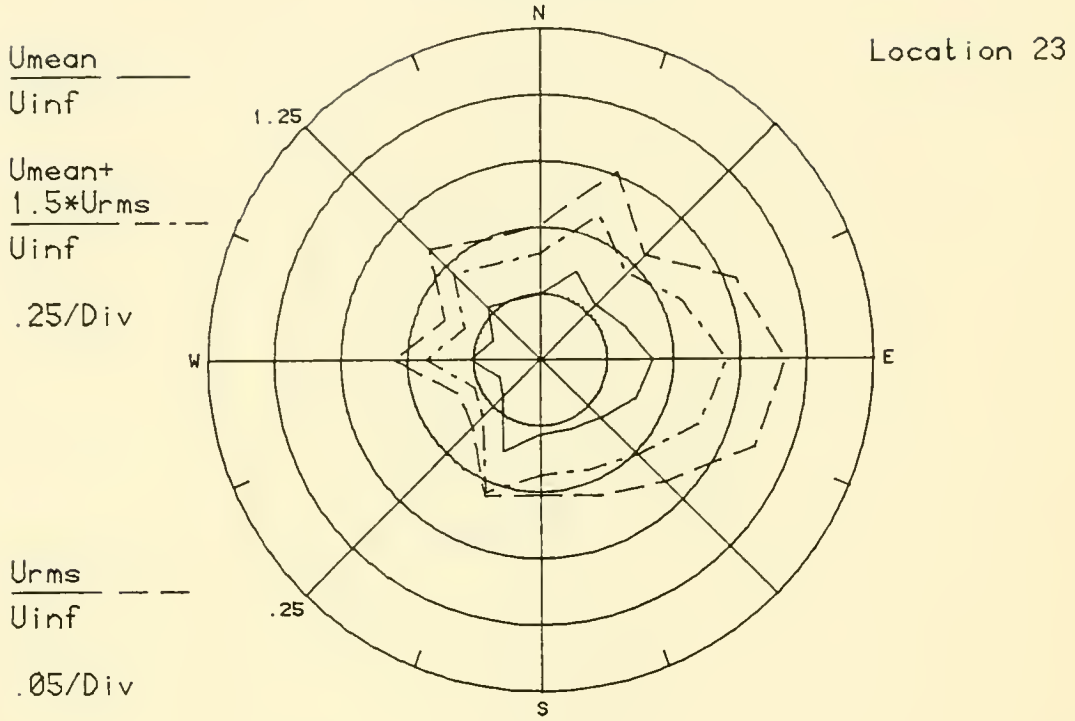

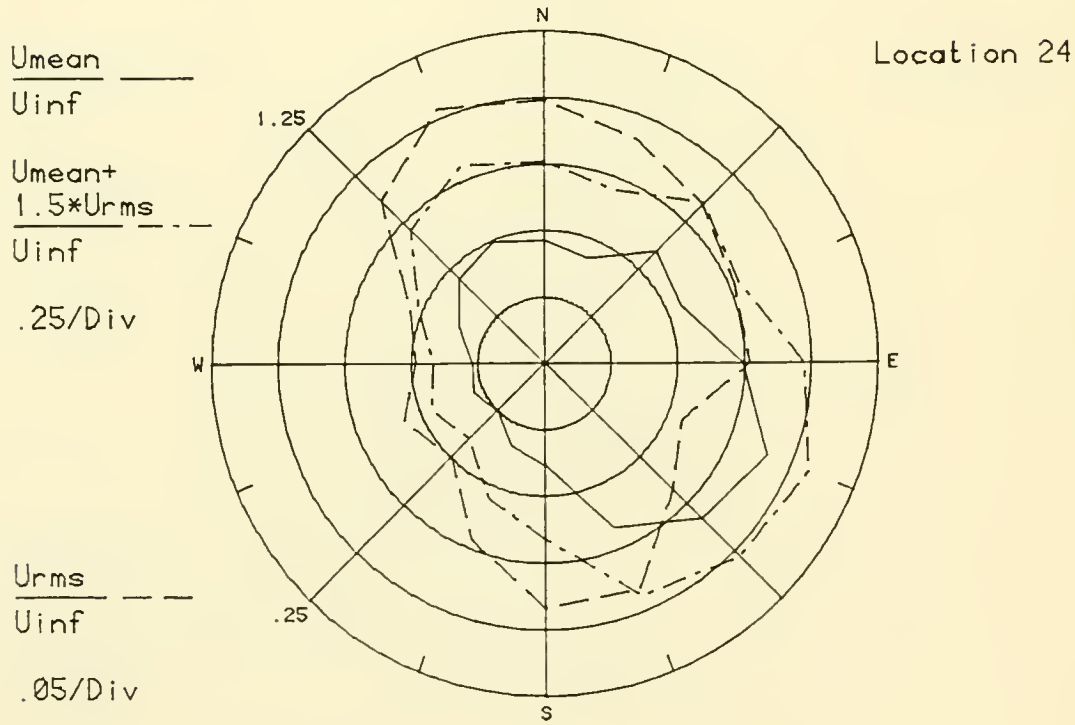

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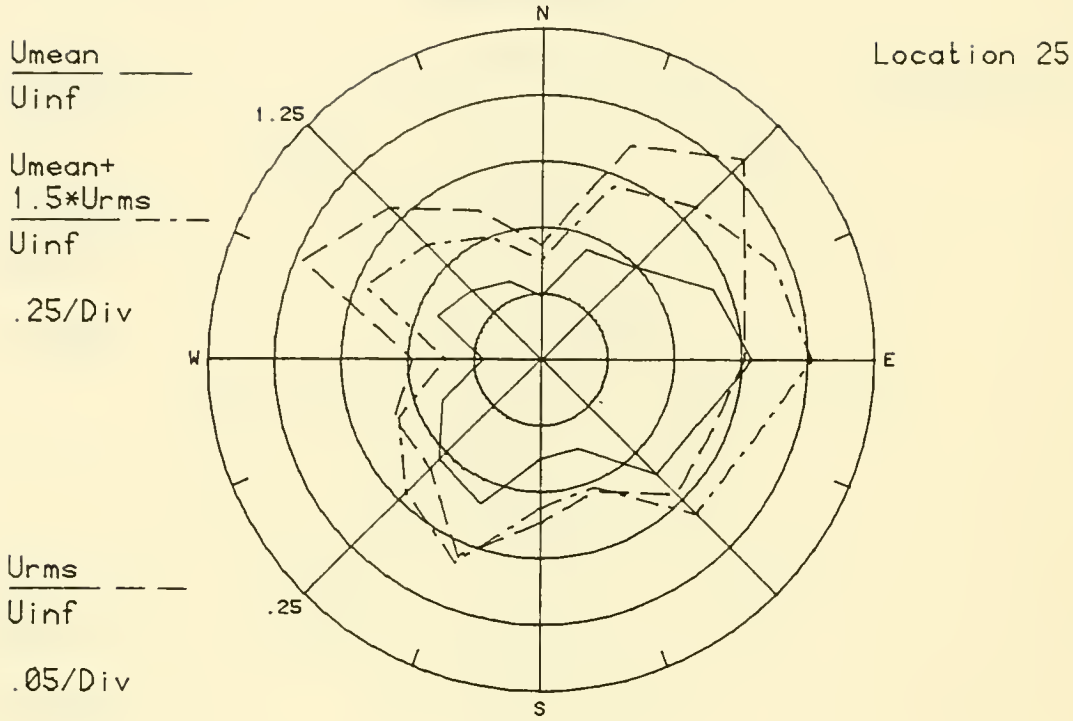

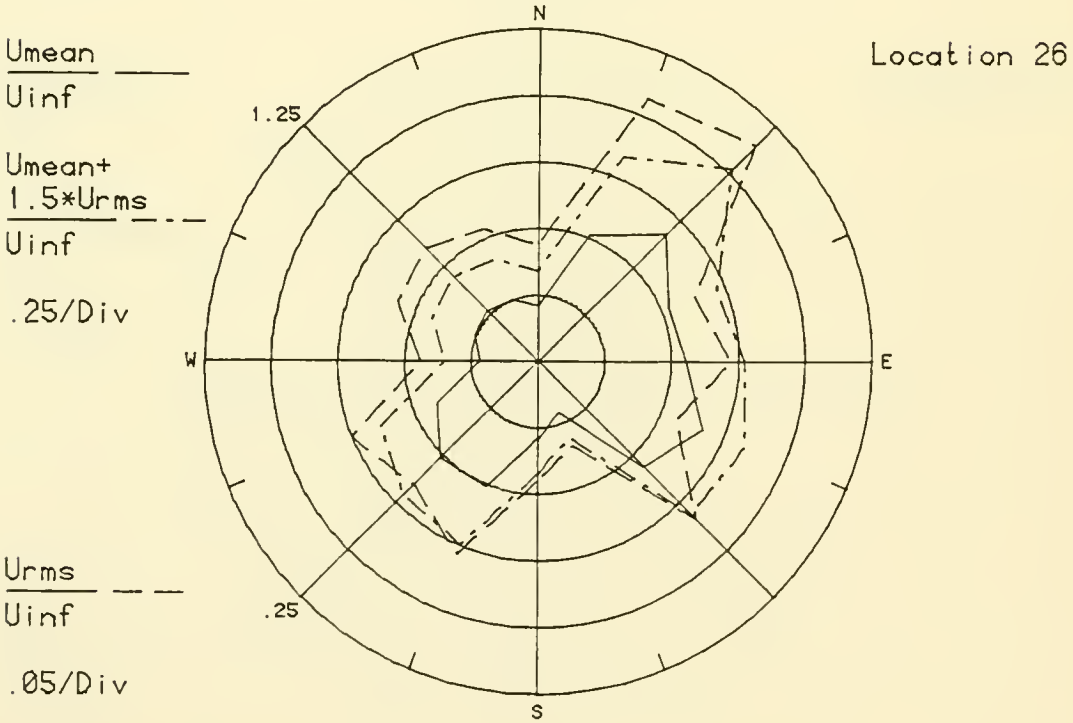

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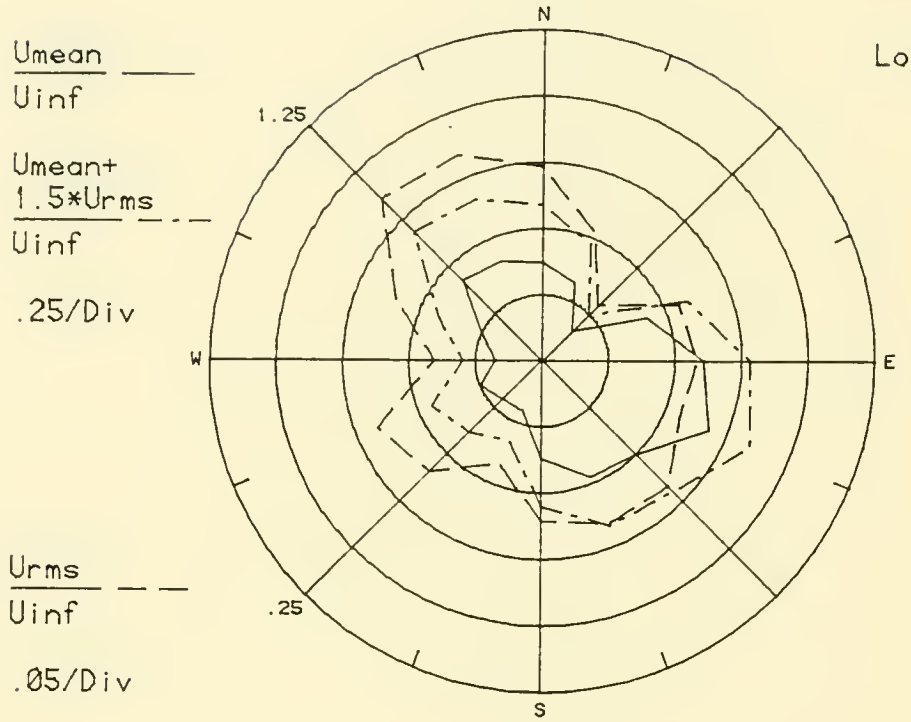

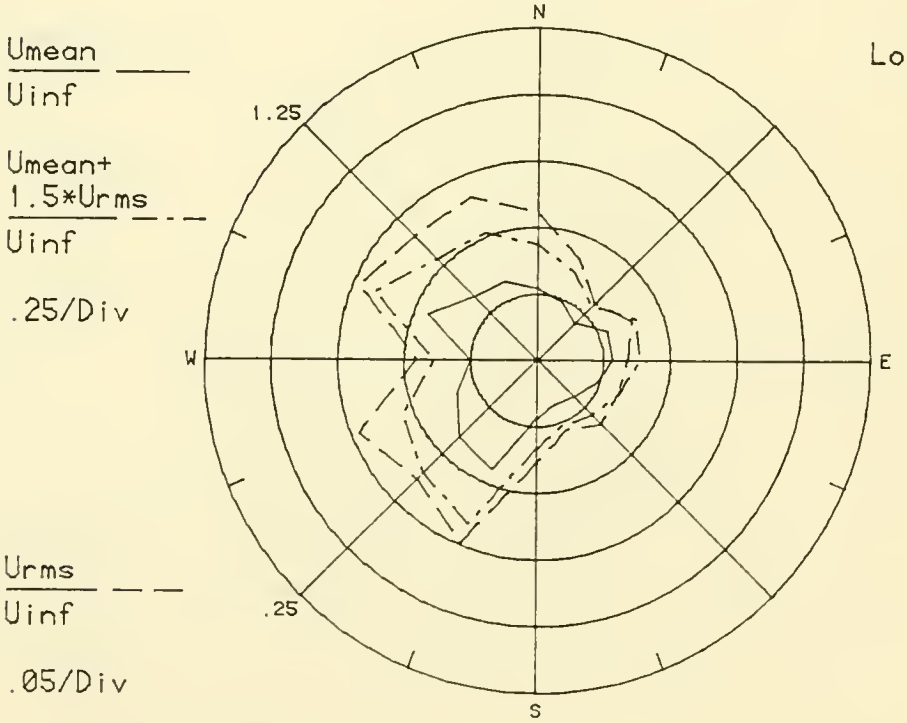

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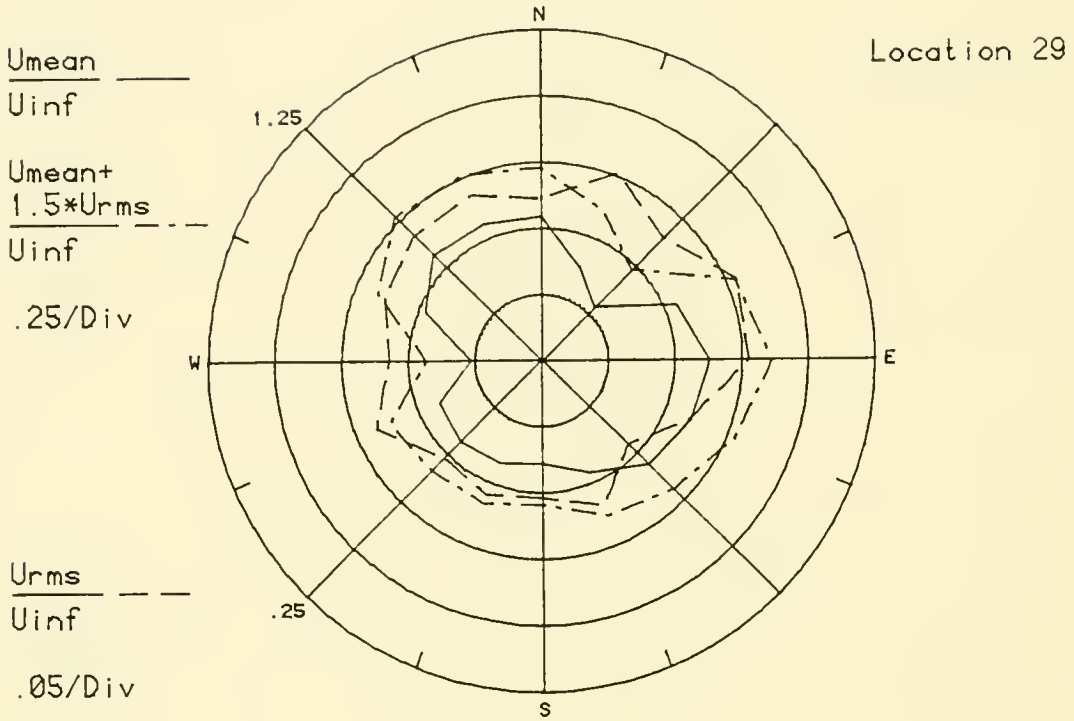

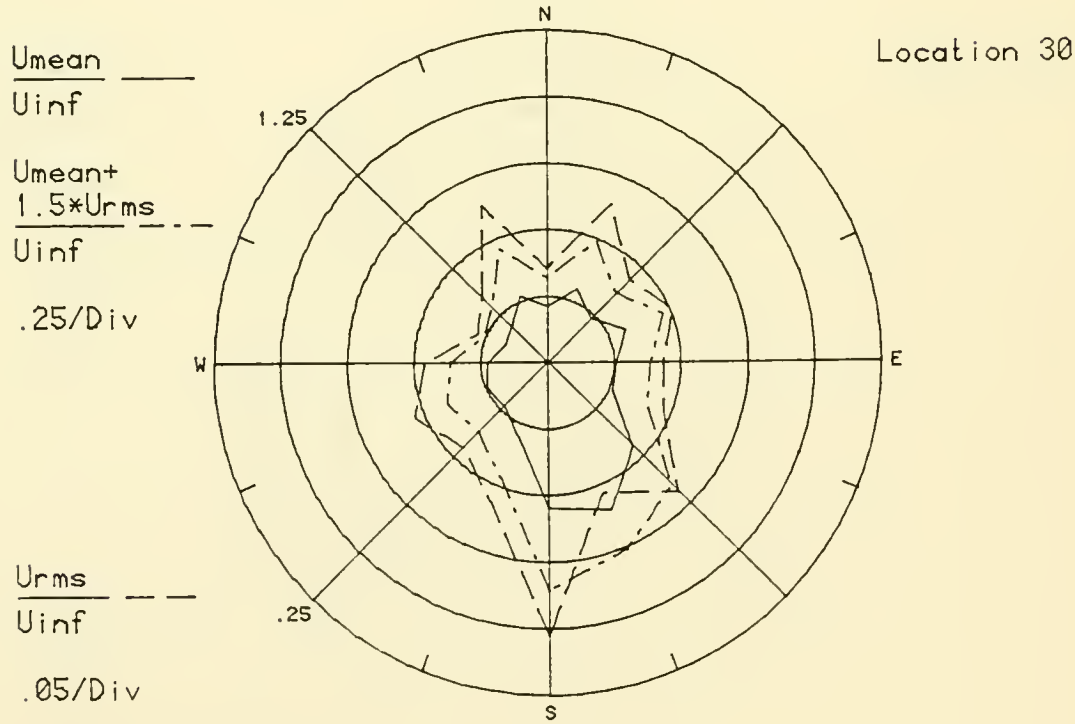

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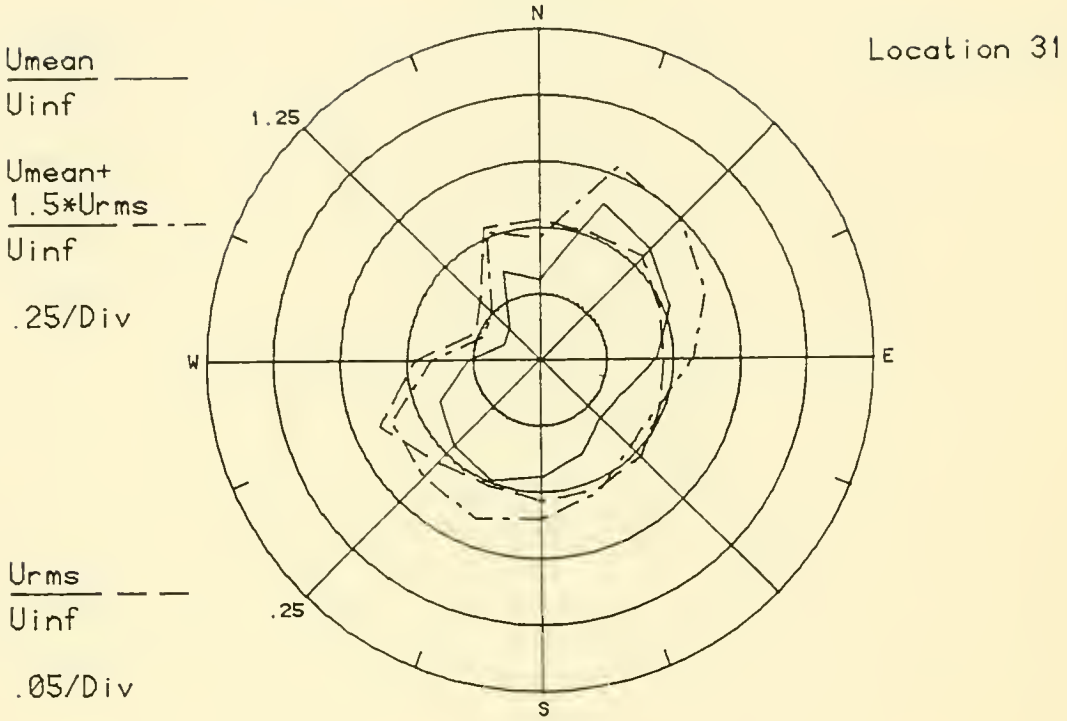

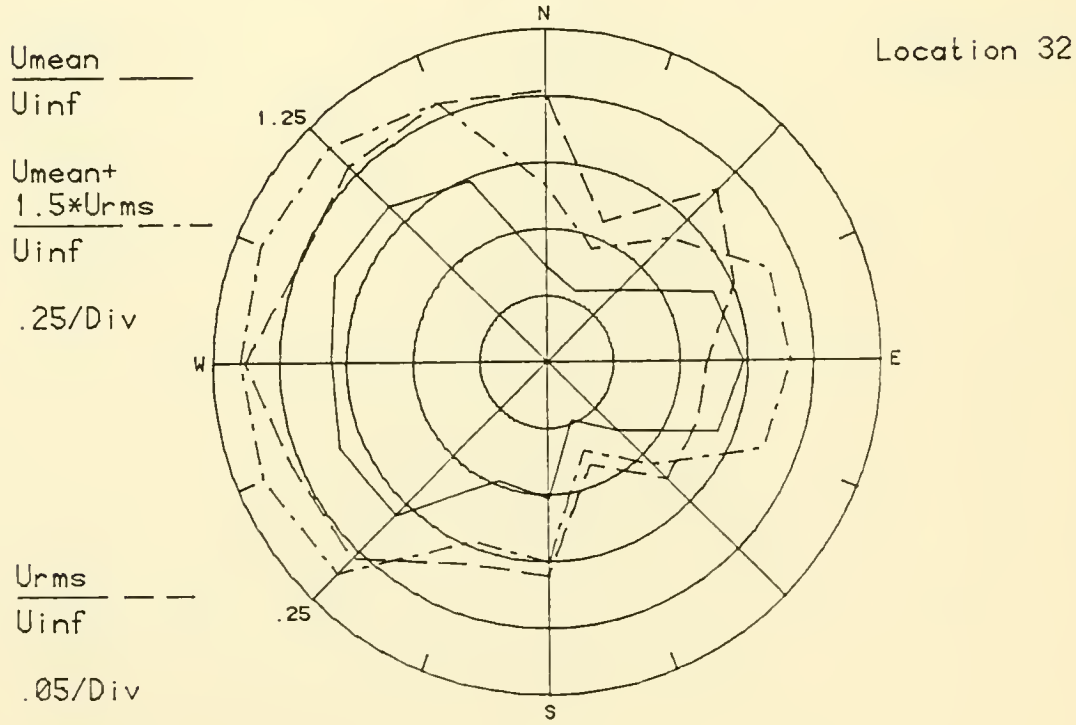

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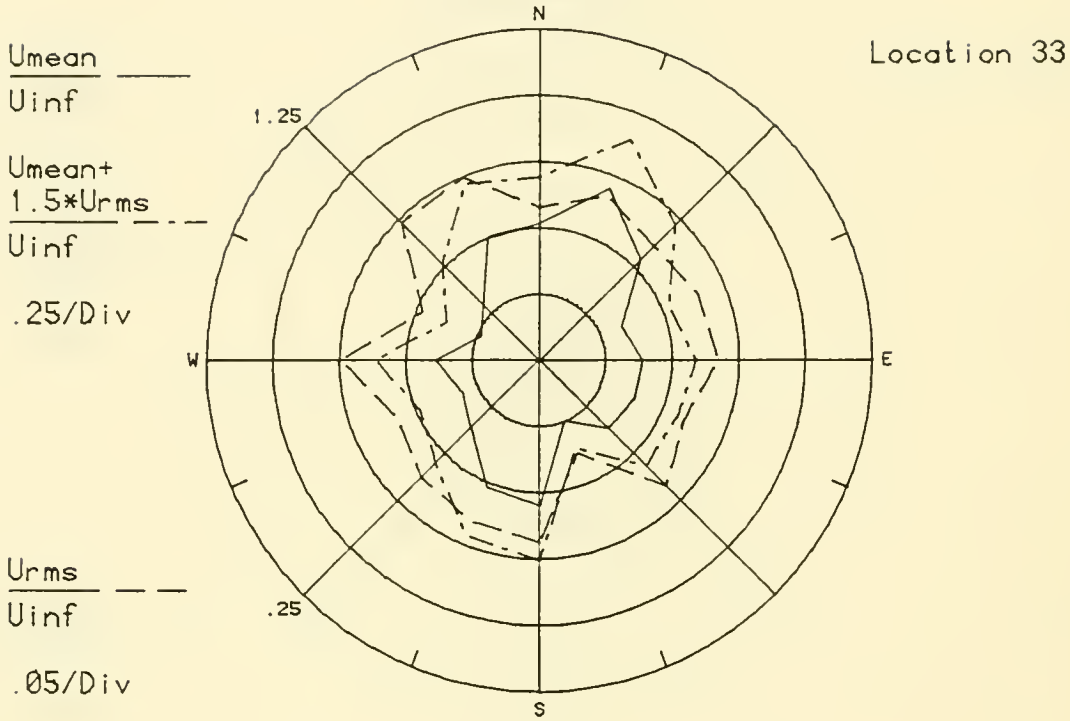

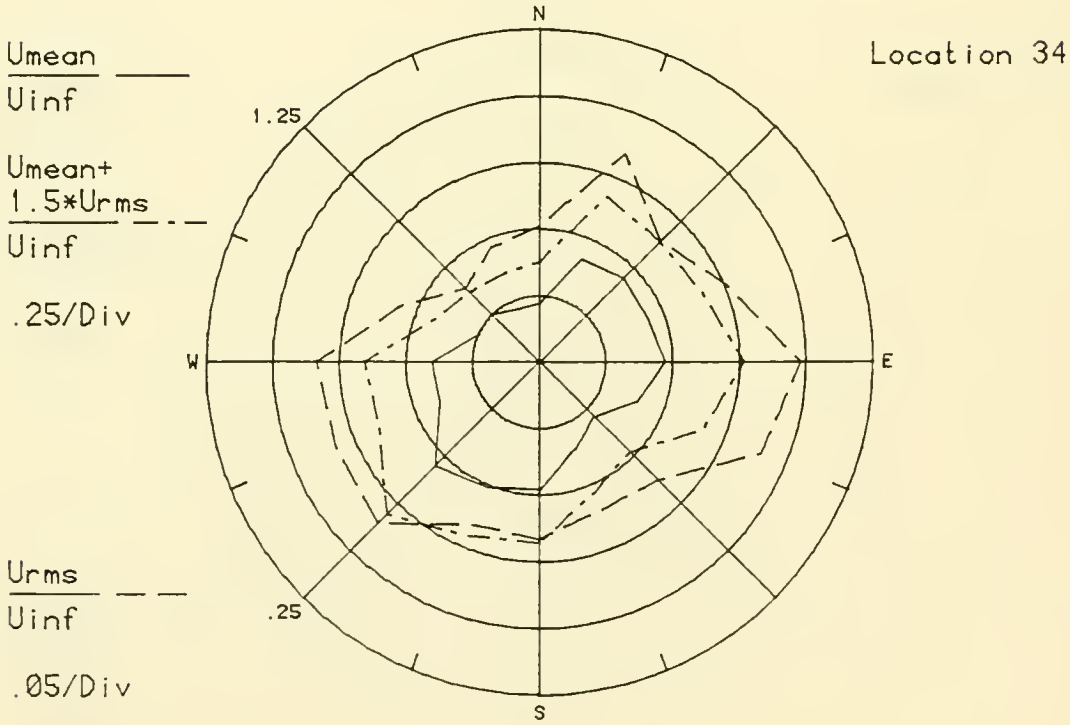

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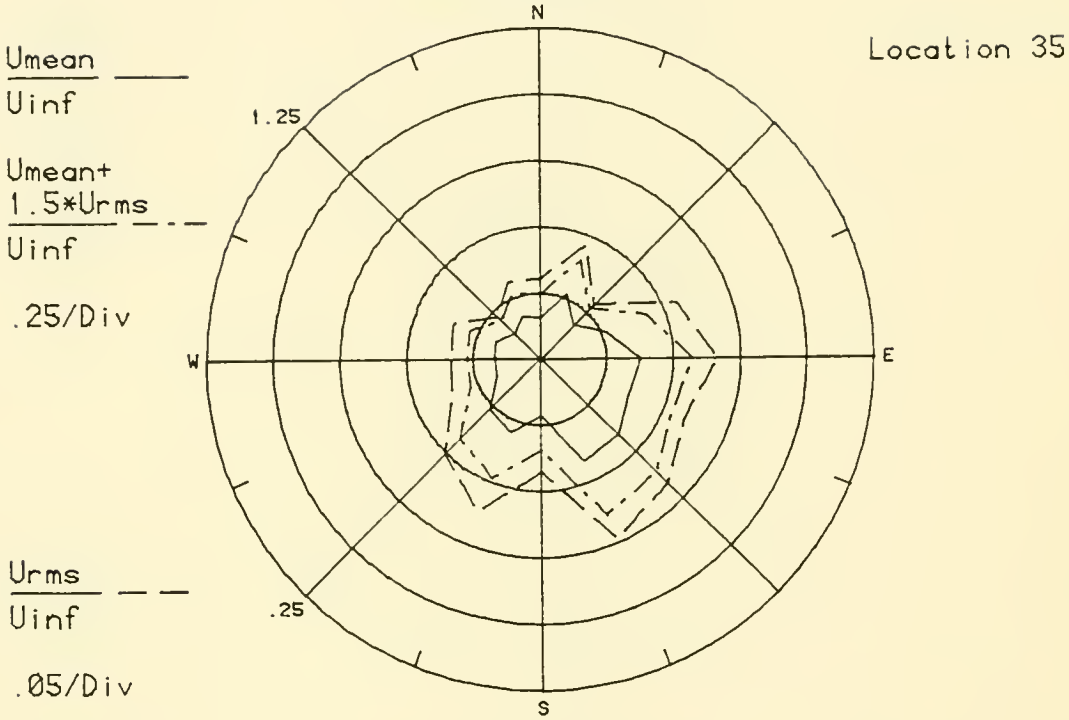

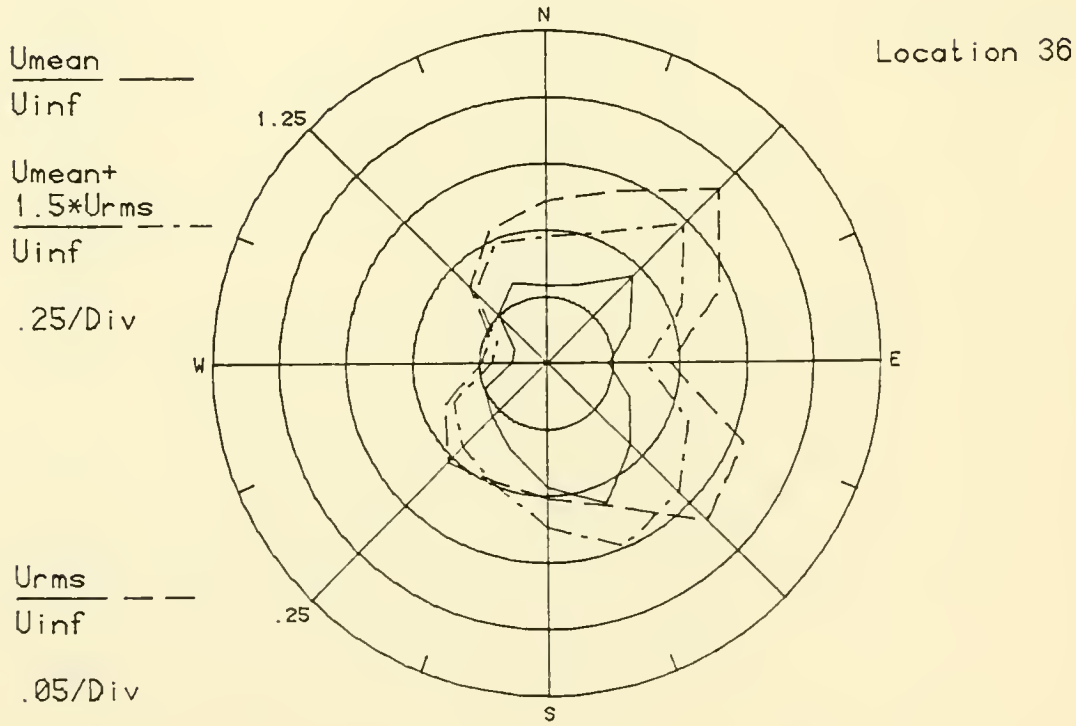

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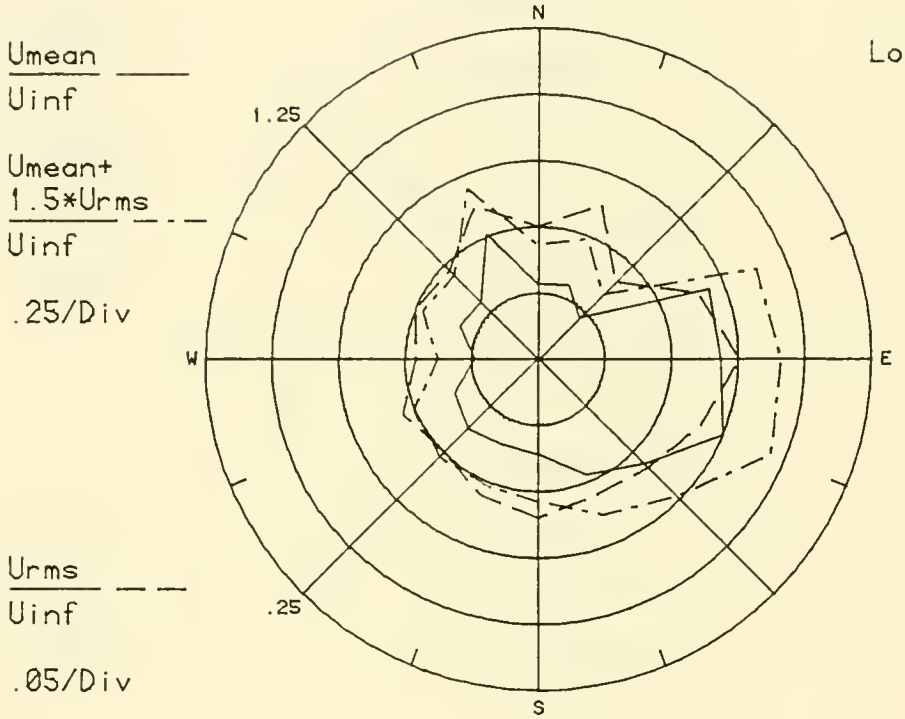

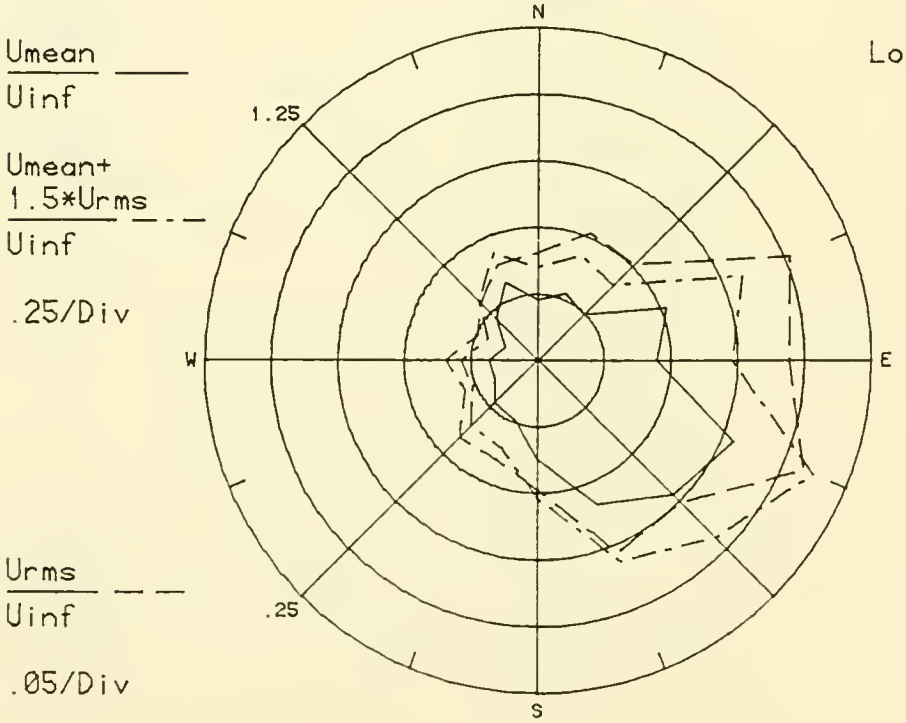

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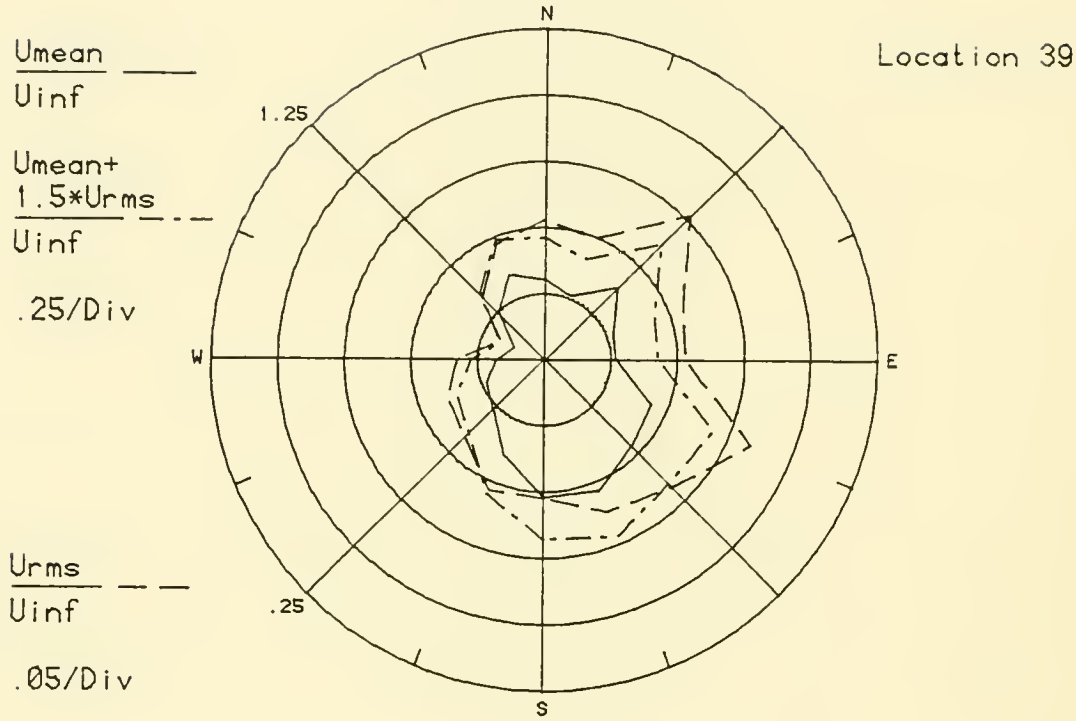

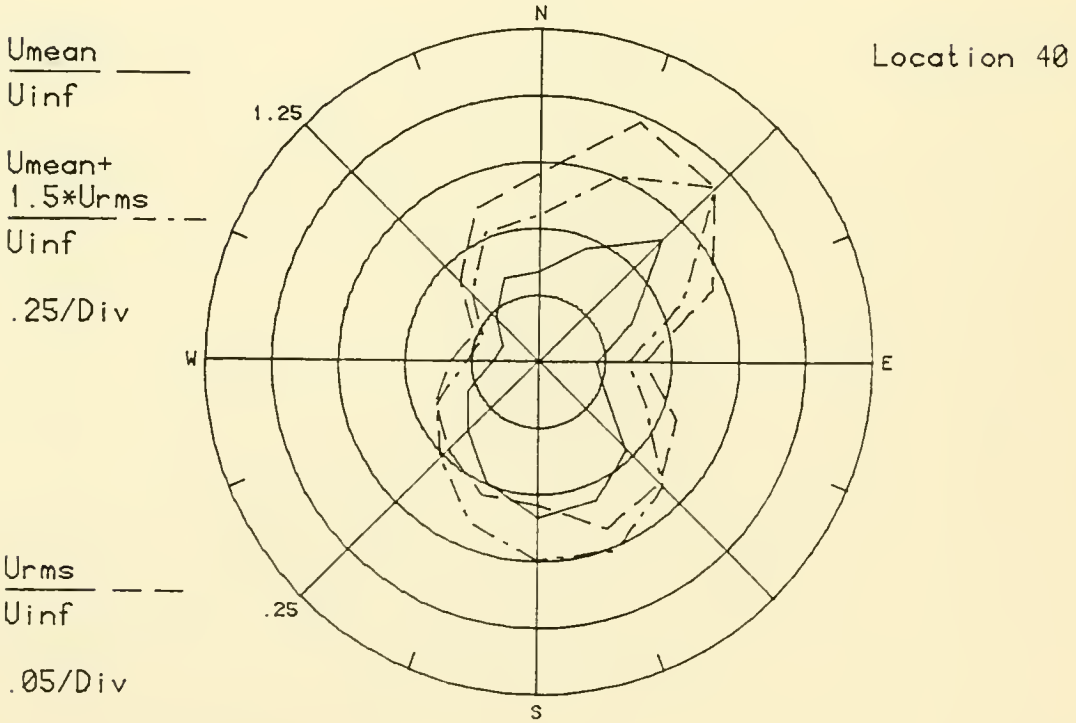

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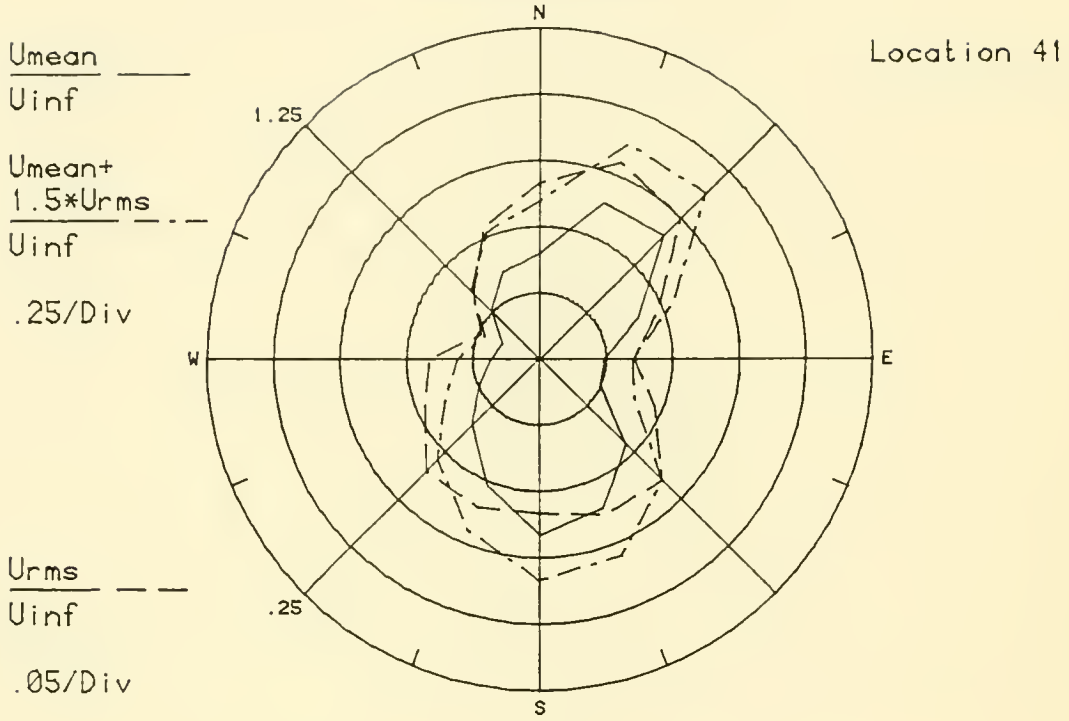
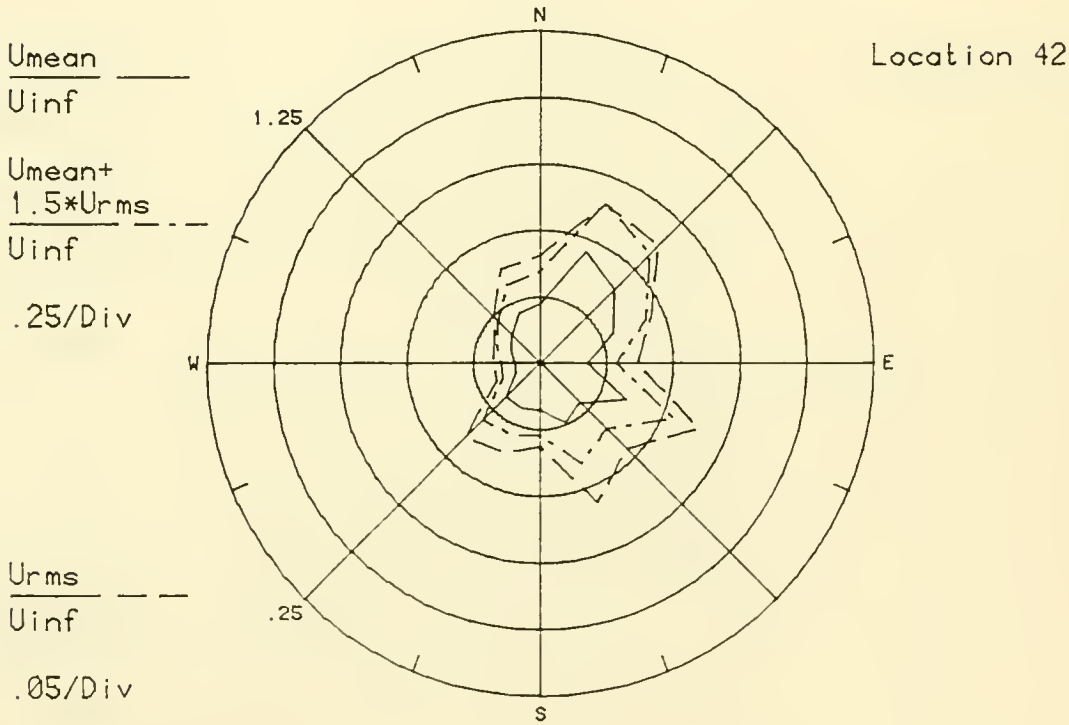
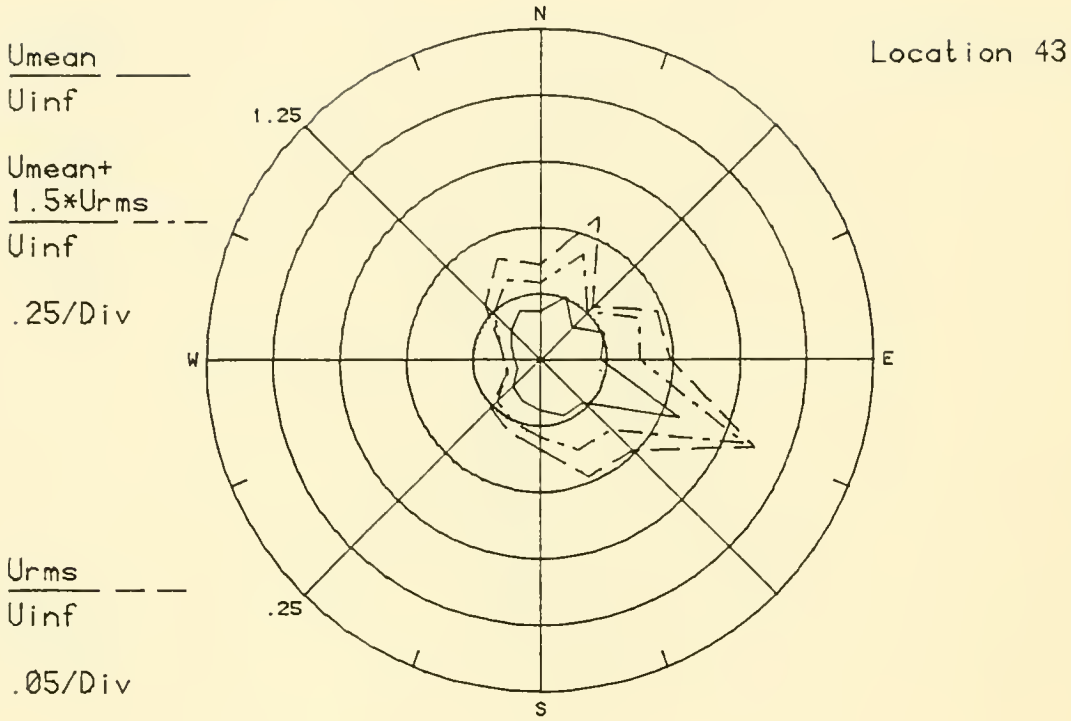
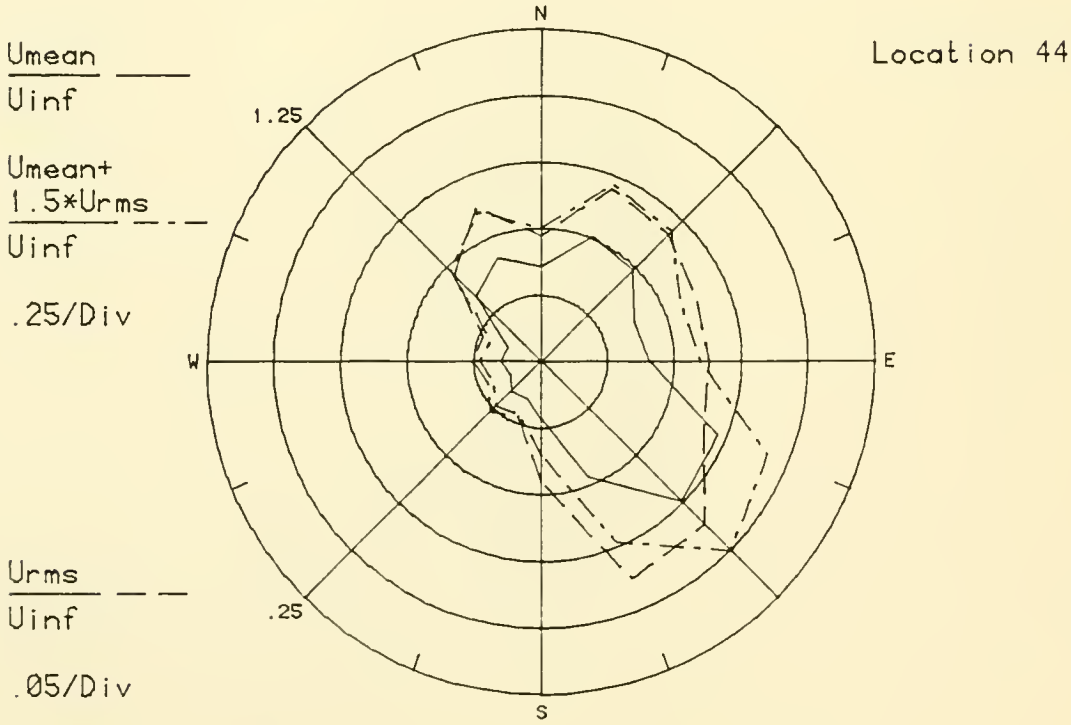


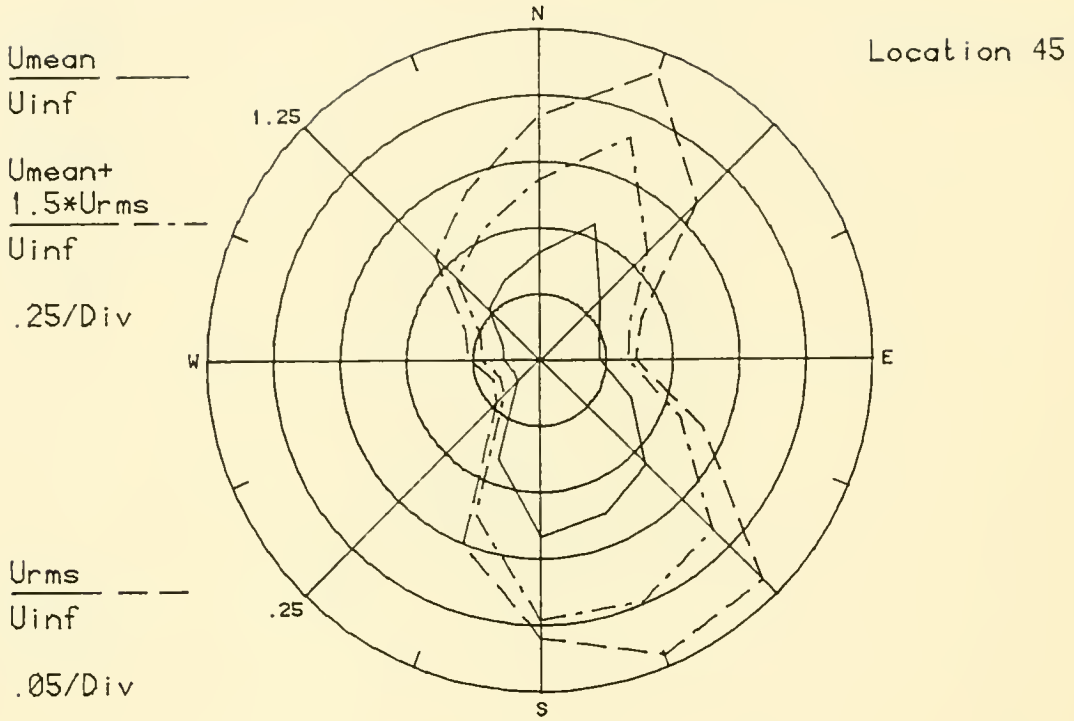


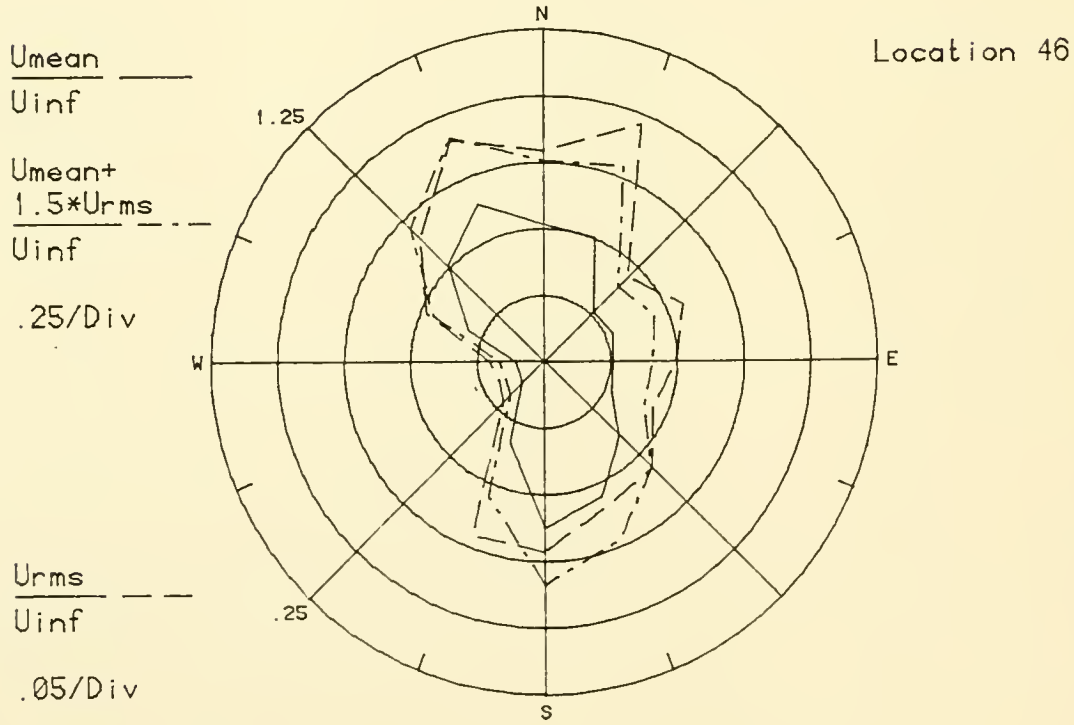
Configuration PH 2





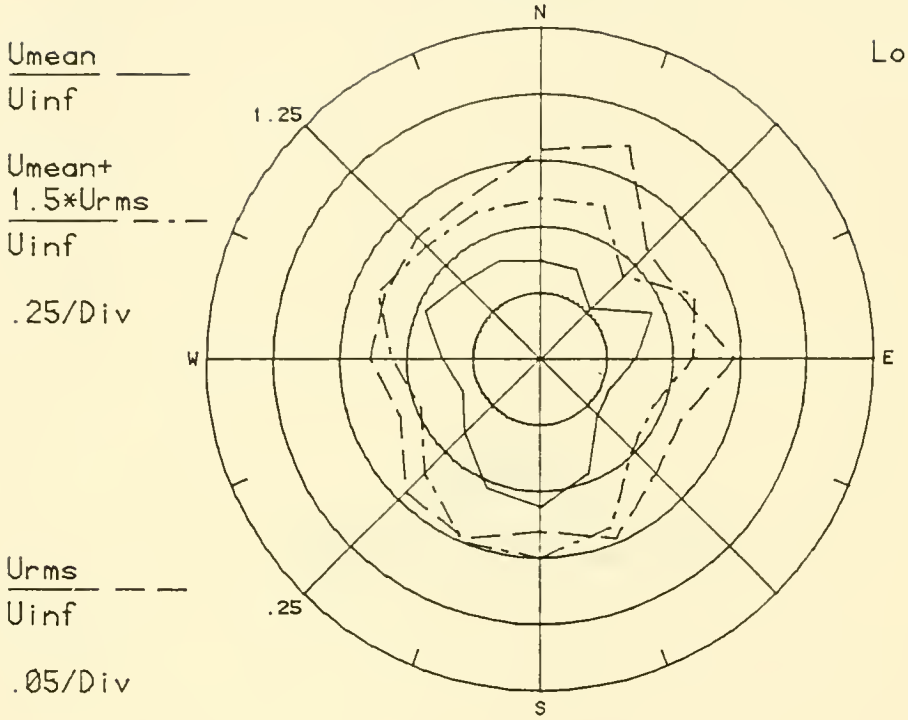
Configuration PH 2





Configuration PH 2

Location 47

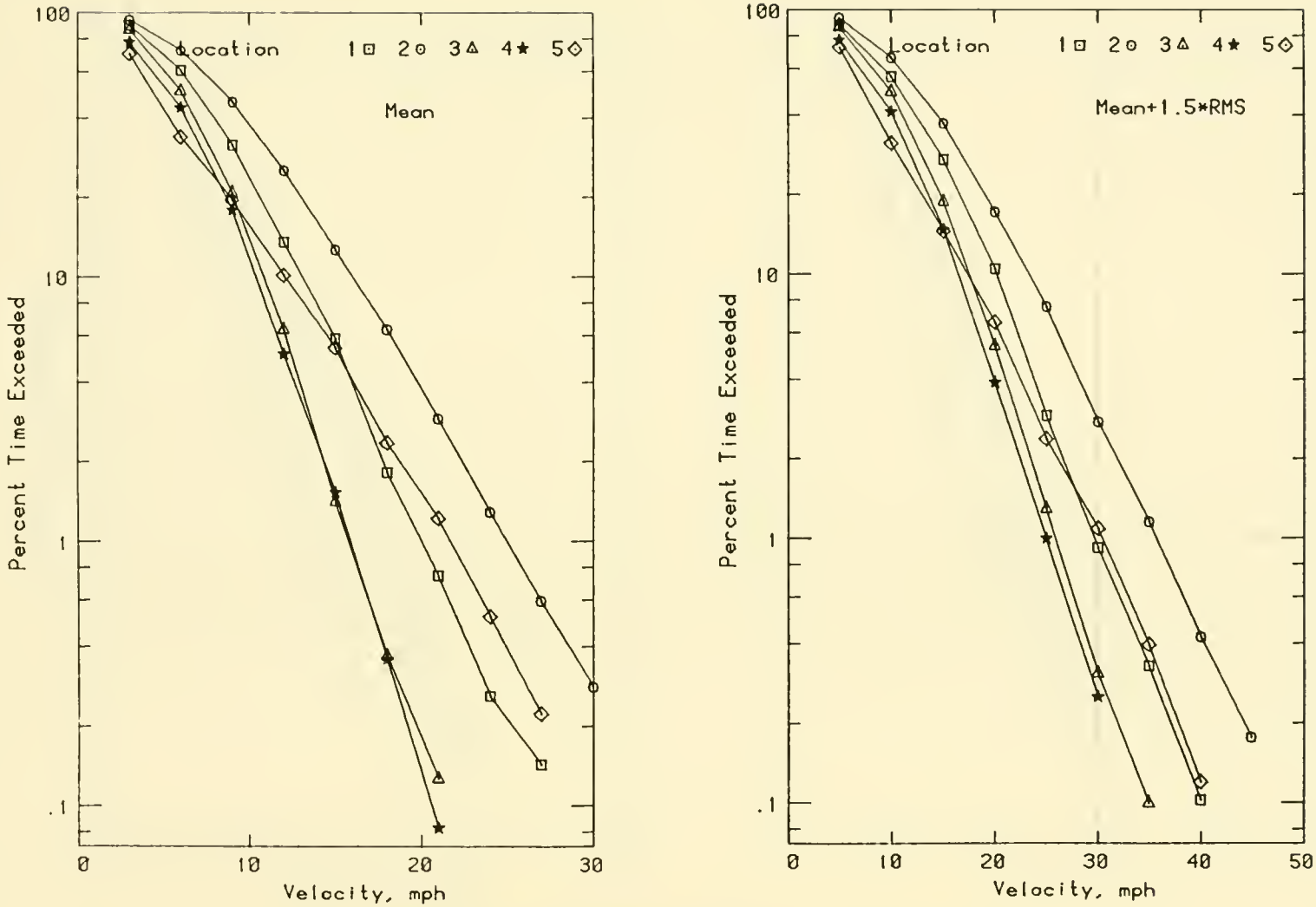


APPENDIX D

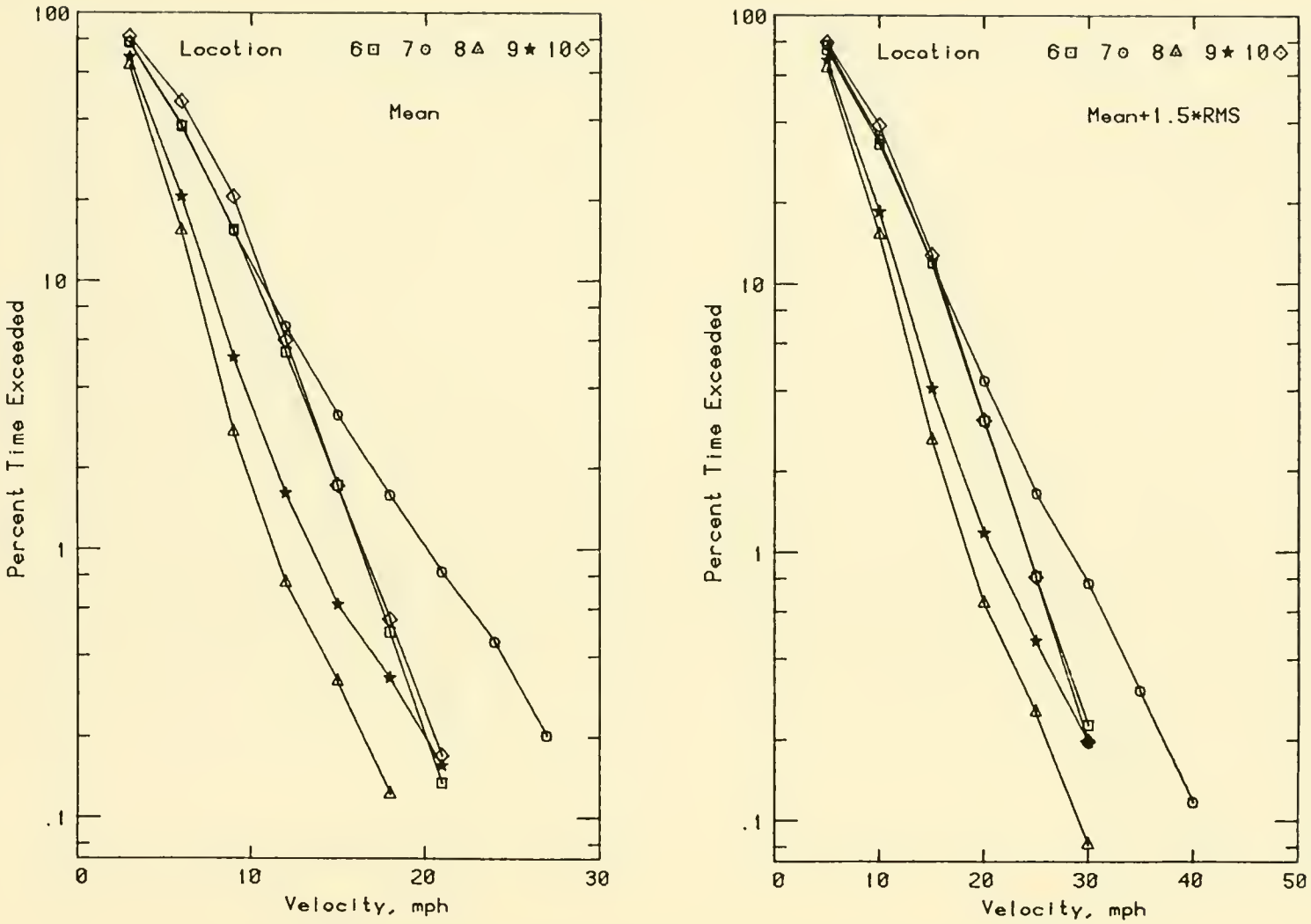
PERCENT TIME EXCEEDED PLOTS

PERCENT TIME EXCEEDED PLOTS

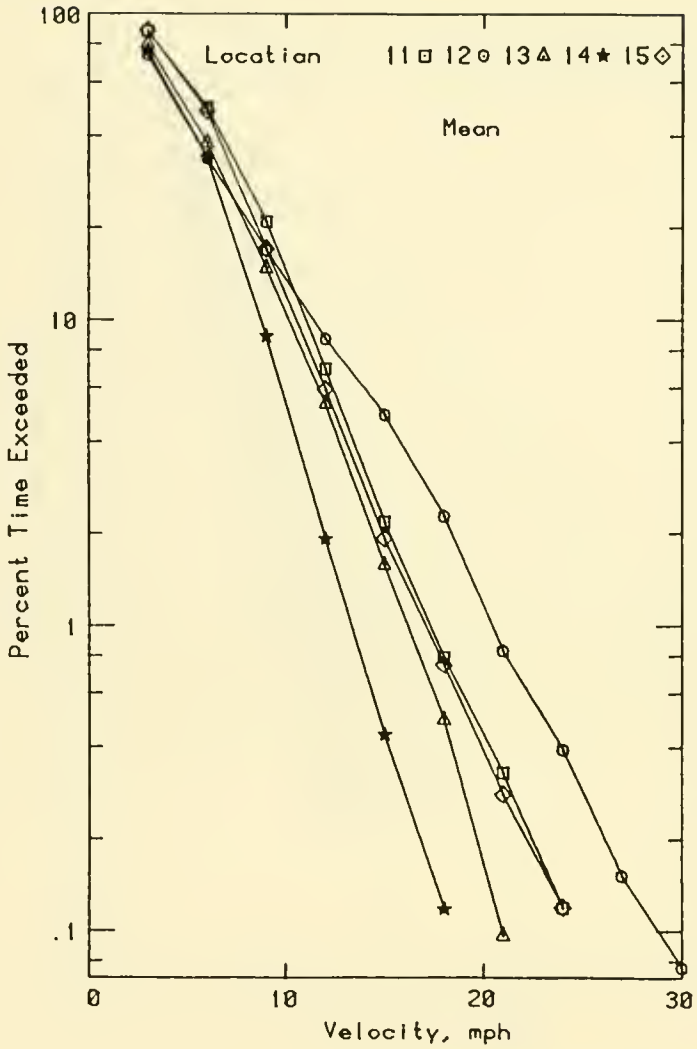
The graphs included in this appendix show the percent of time for which a given mean or gust velocity is exceeded for each pedestrian location for each configuration.

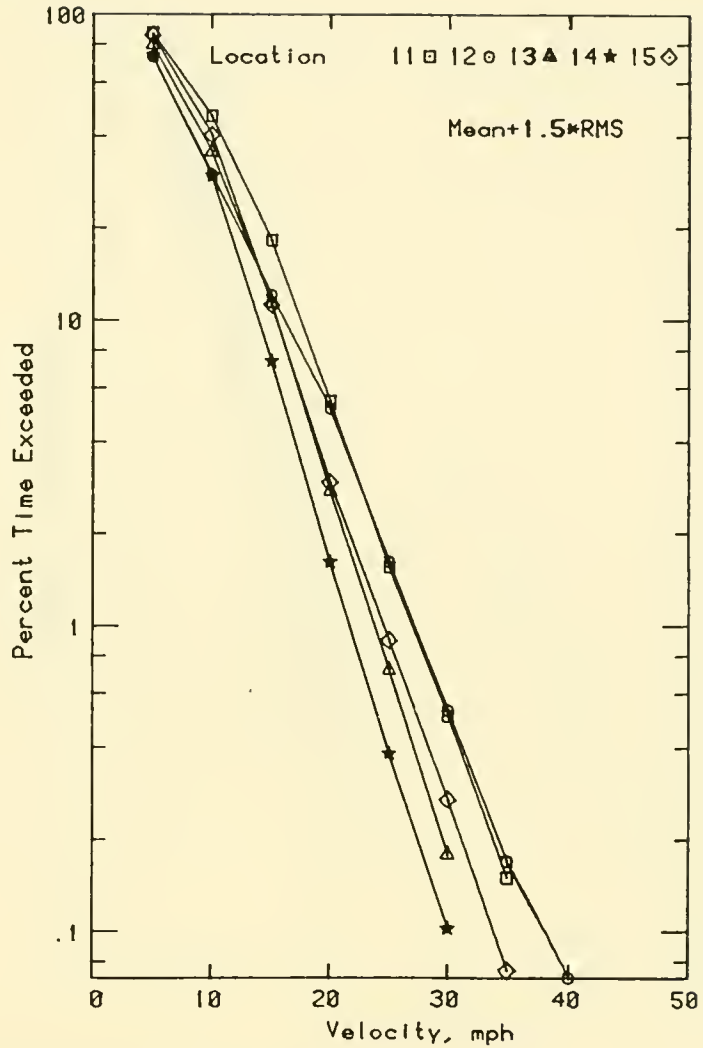


Percent Time Exceeded for PRE Configuration

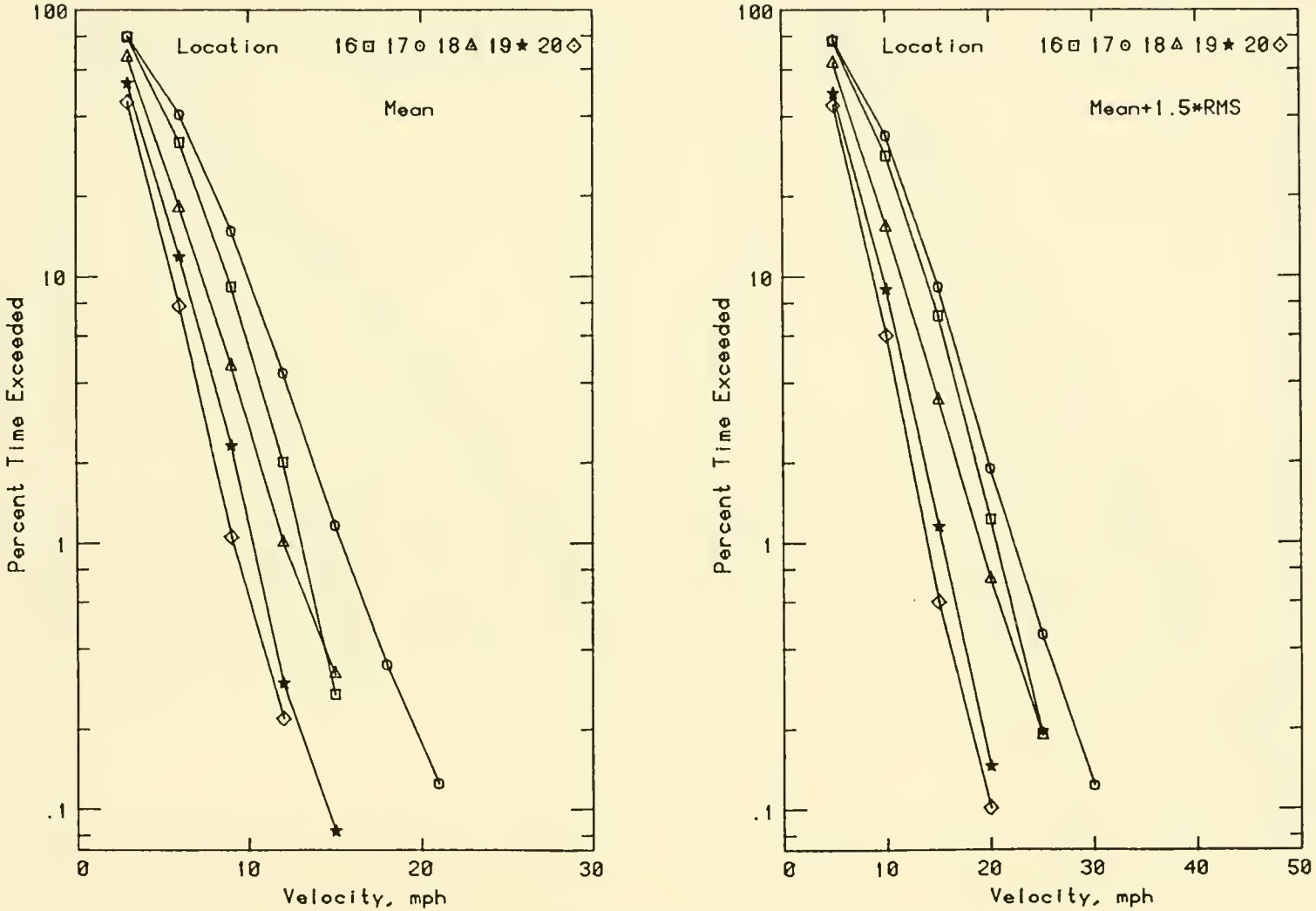


Percent Time Exceeded for PRE Configuration

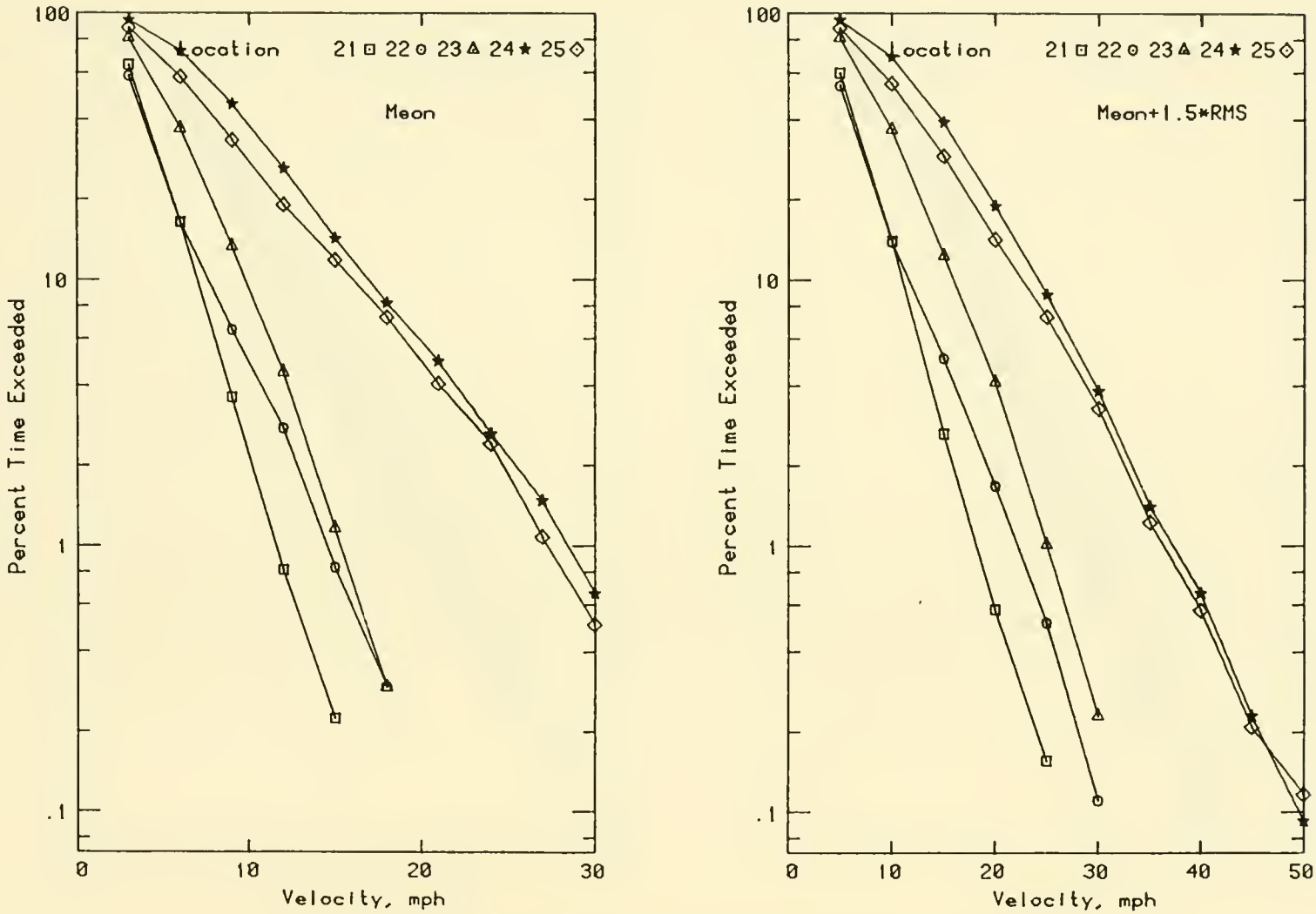




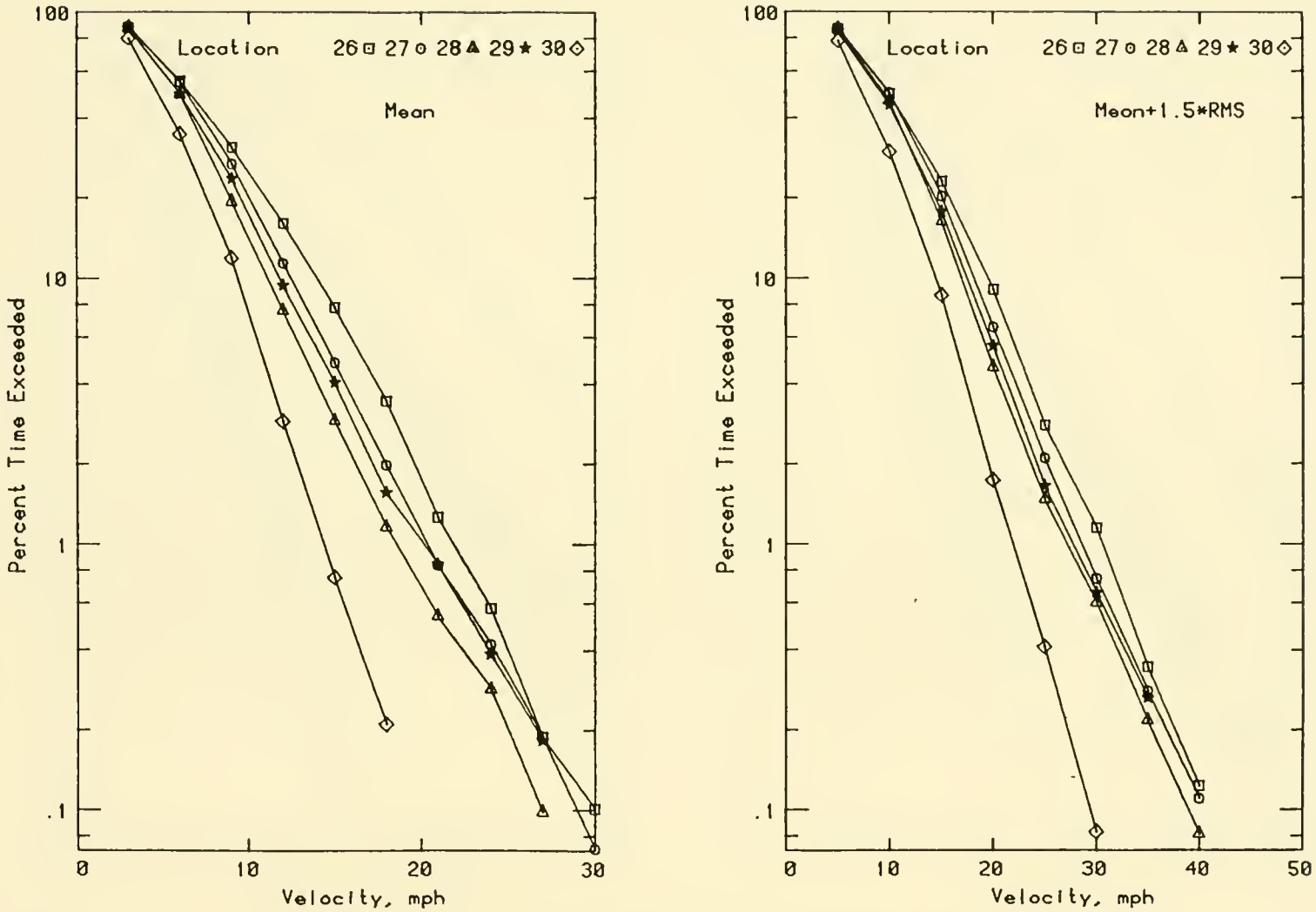
Percent Time Exceeded for PRE Configuration



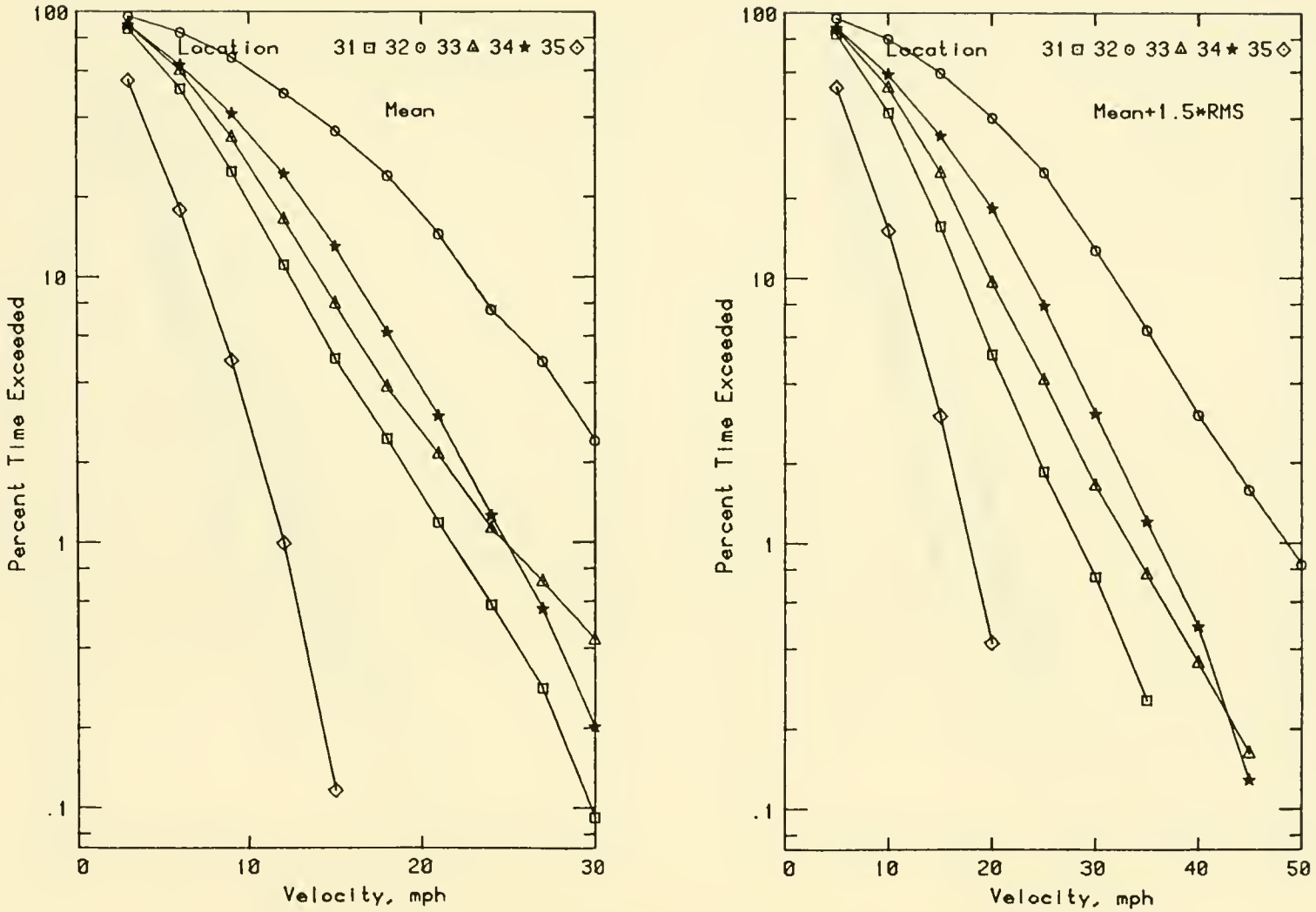
Percent Time Exceeded for PRE Configuration



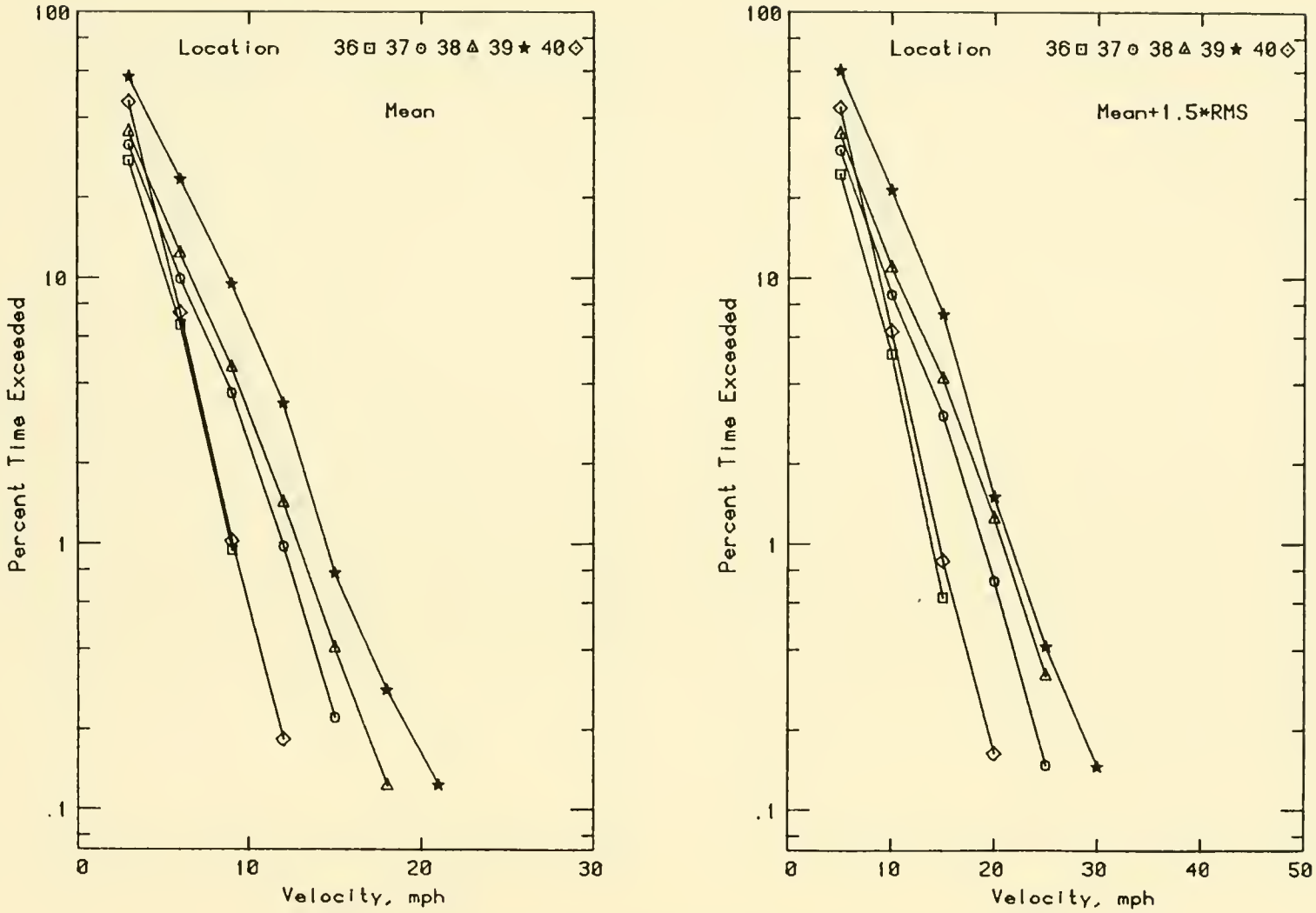
Percent Time Exceeded for PRE Configuration



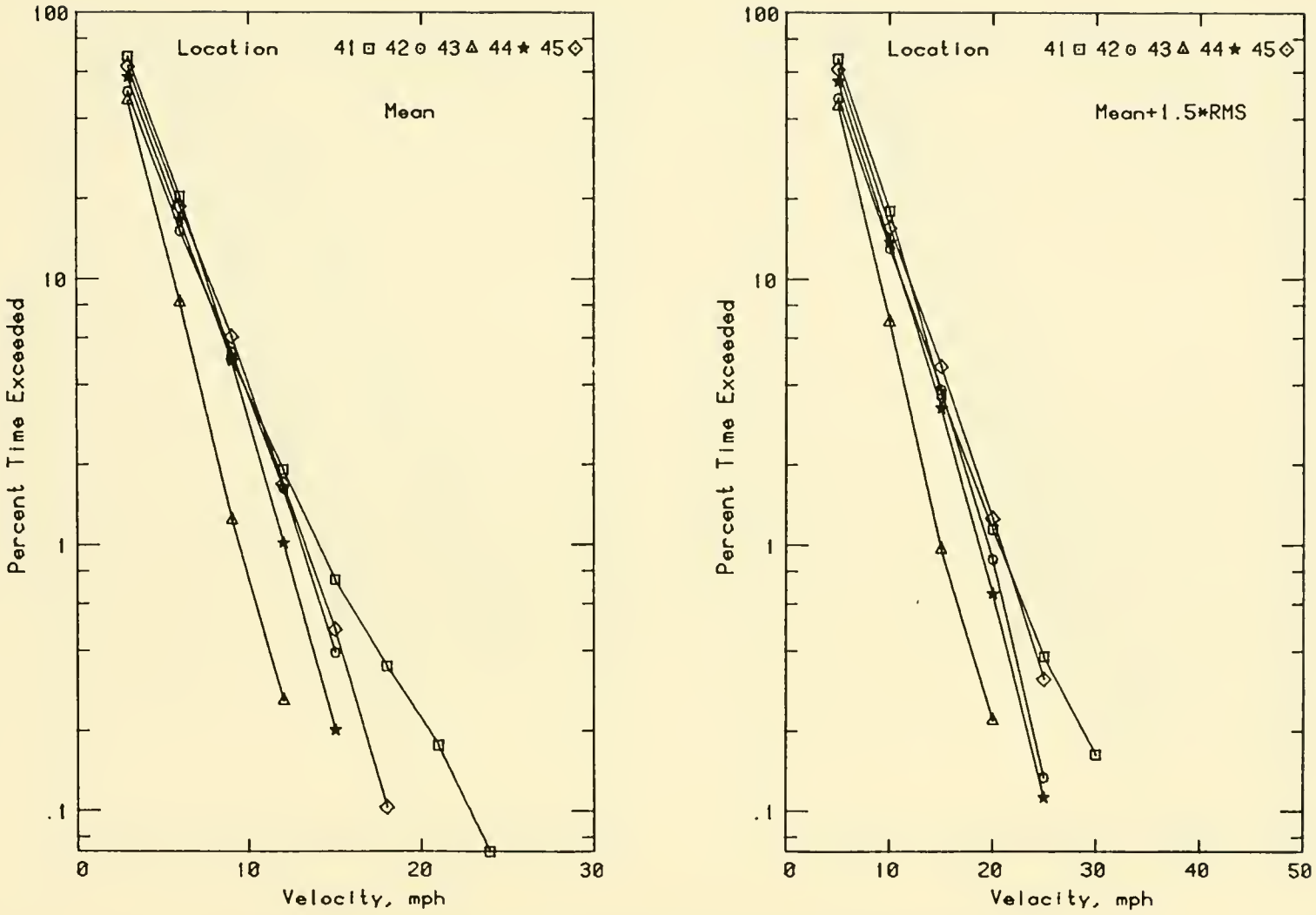
Percent Time Exceeded for PRE Configuration



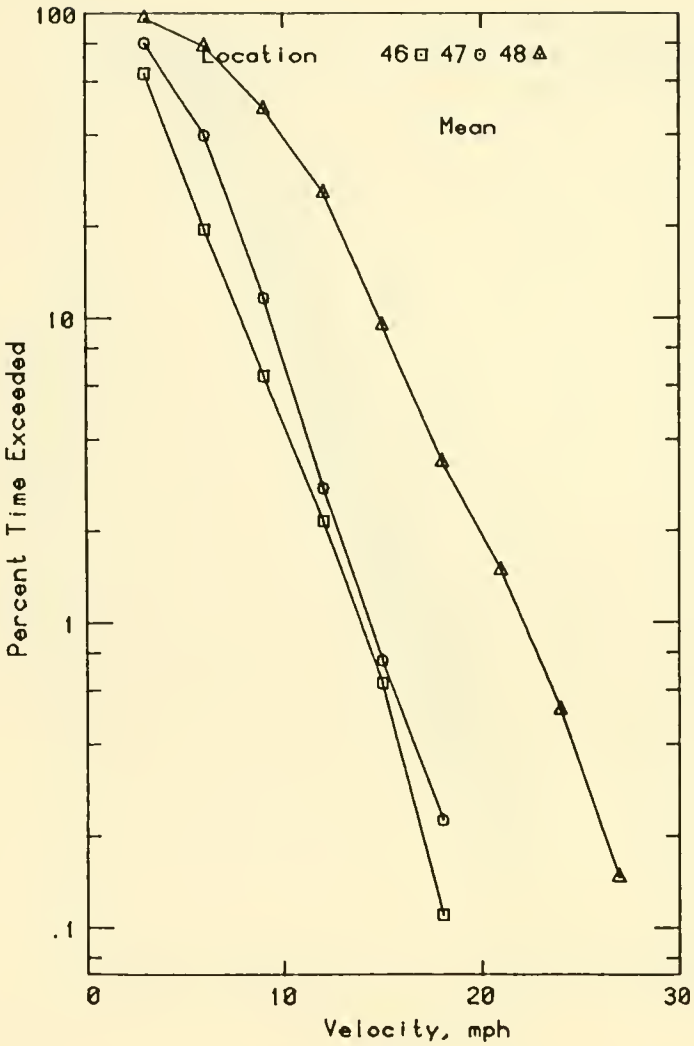
Percent Time Exceeded for PRE Configuration

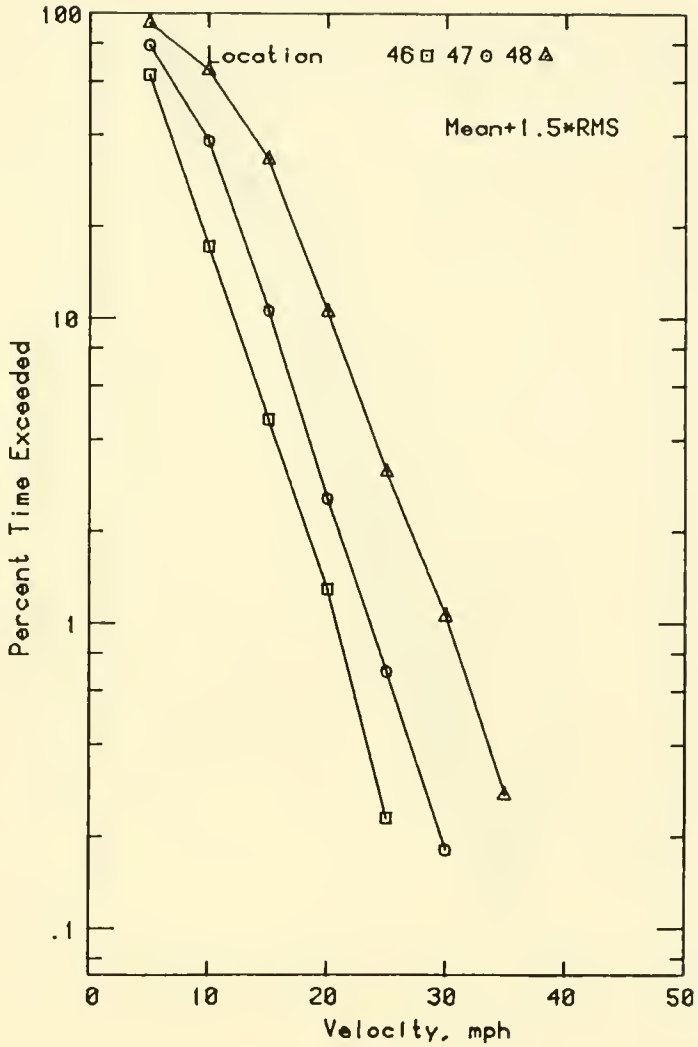


Percent Time Exceeded for PRE Configuration

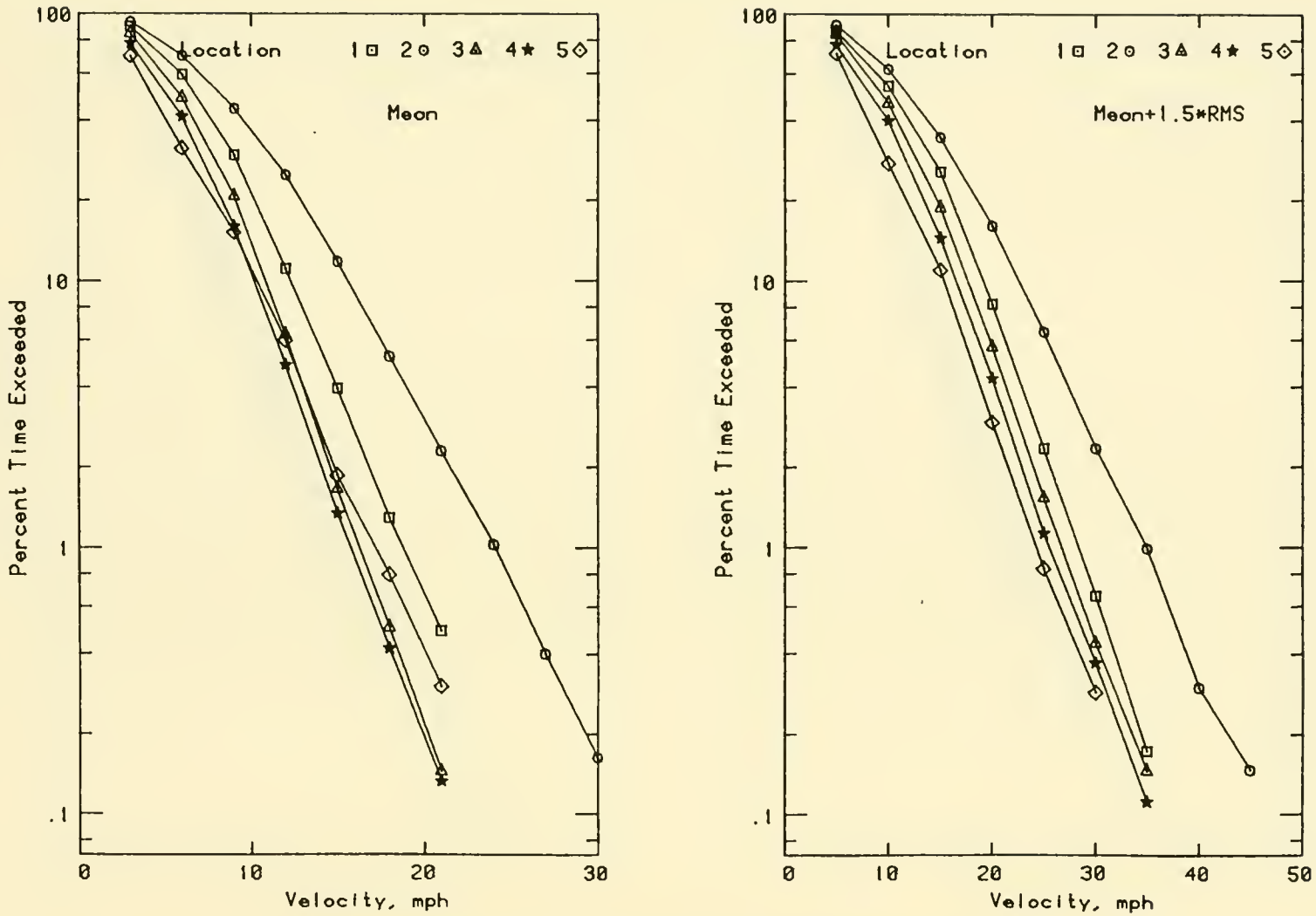


Percent Time Exceeded for PRE Configuration

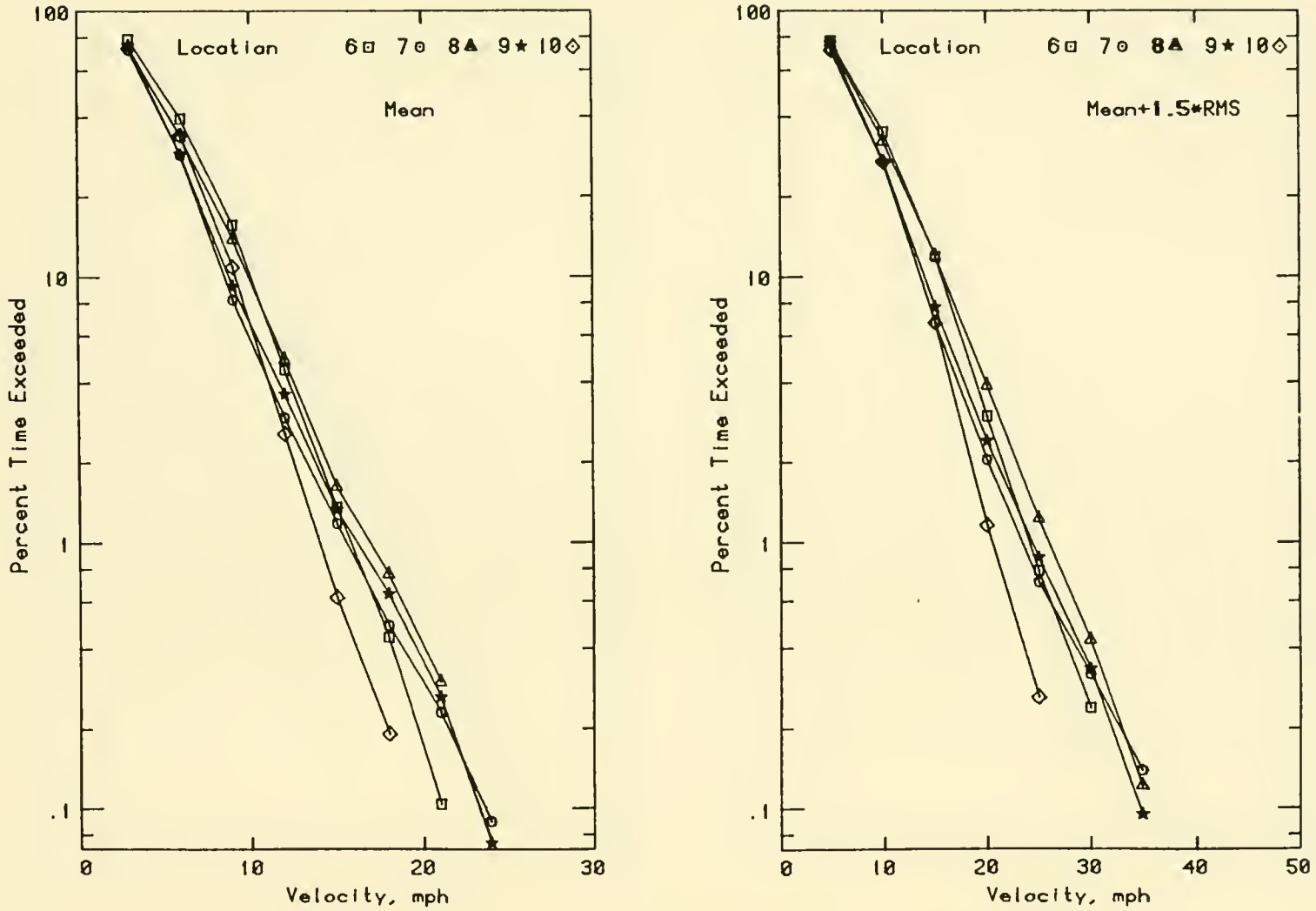




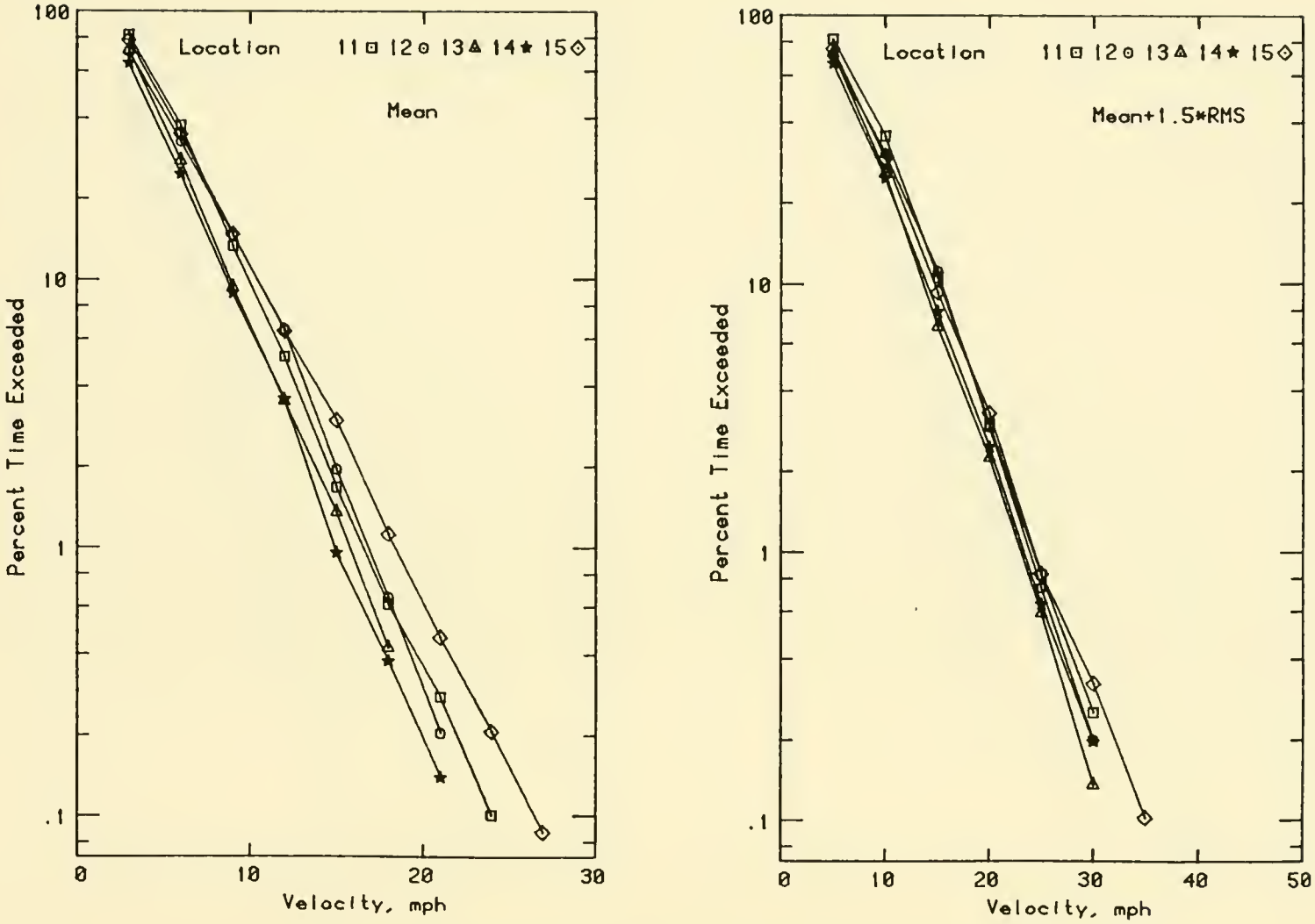
Percent Time Exceeded for PRE Configuration



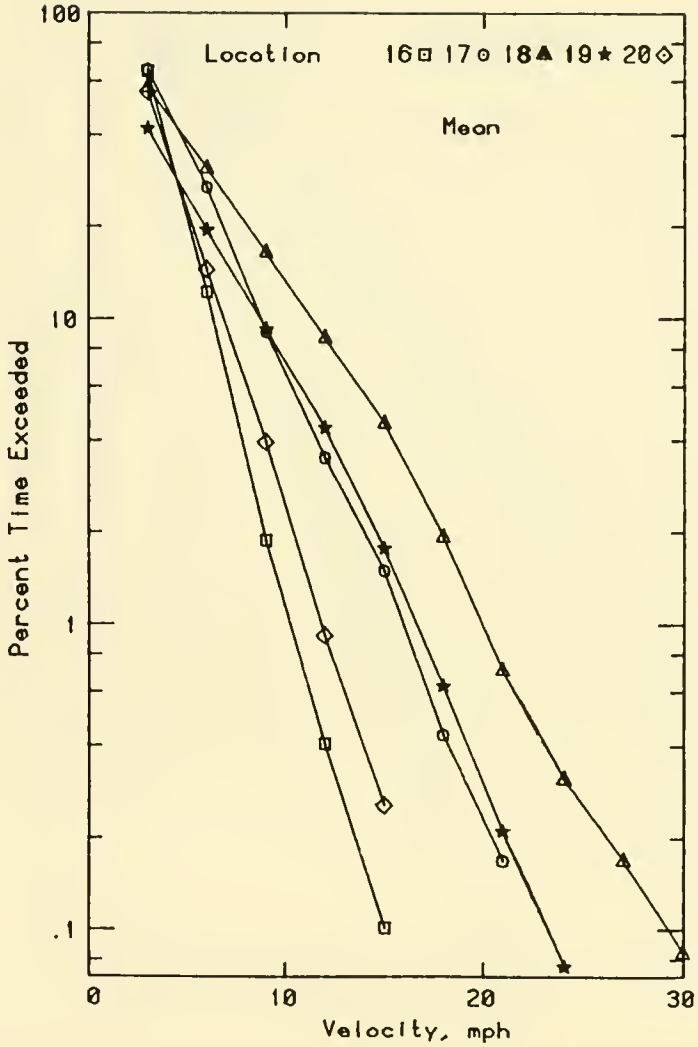
Percent Time Exceeded for PH1 Configuration

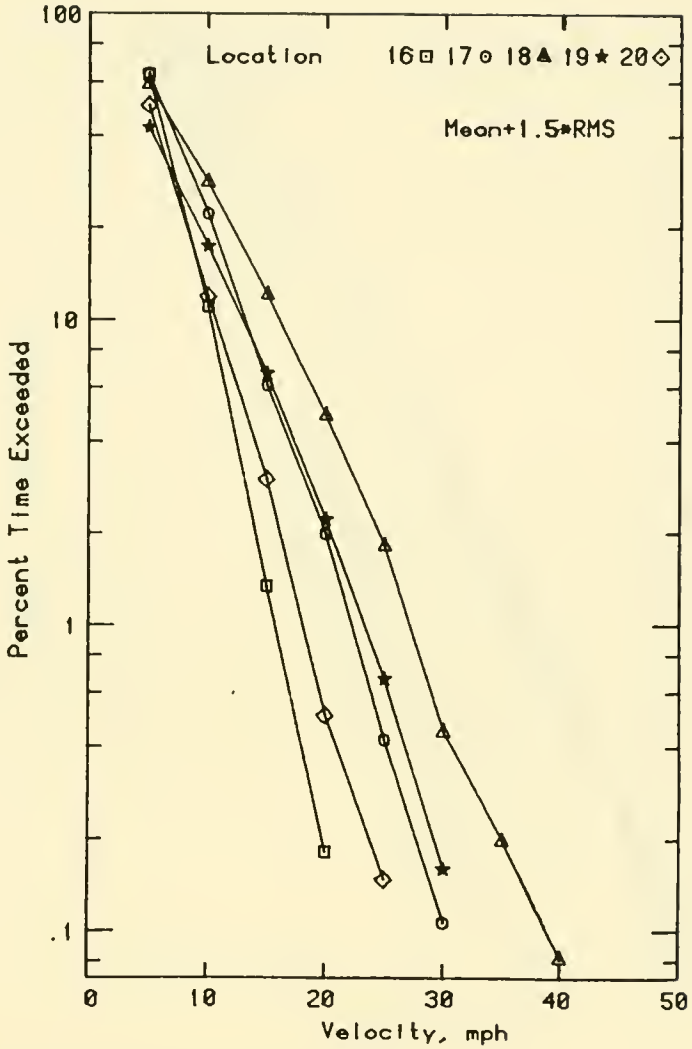


Percent Time Exceeded for PH1 Configuration

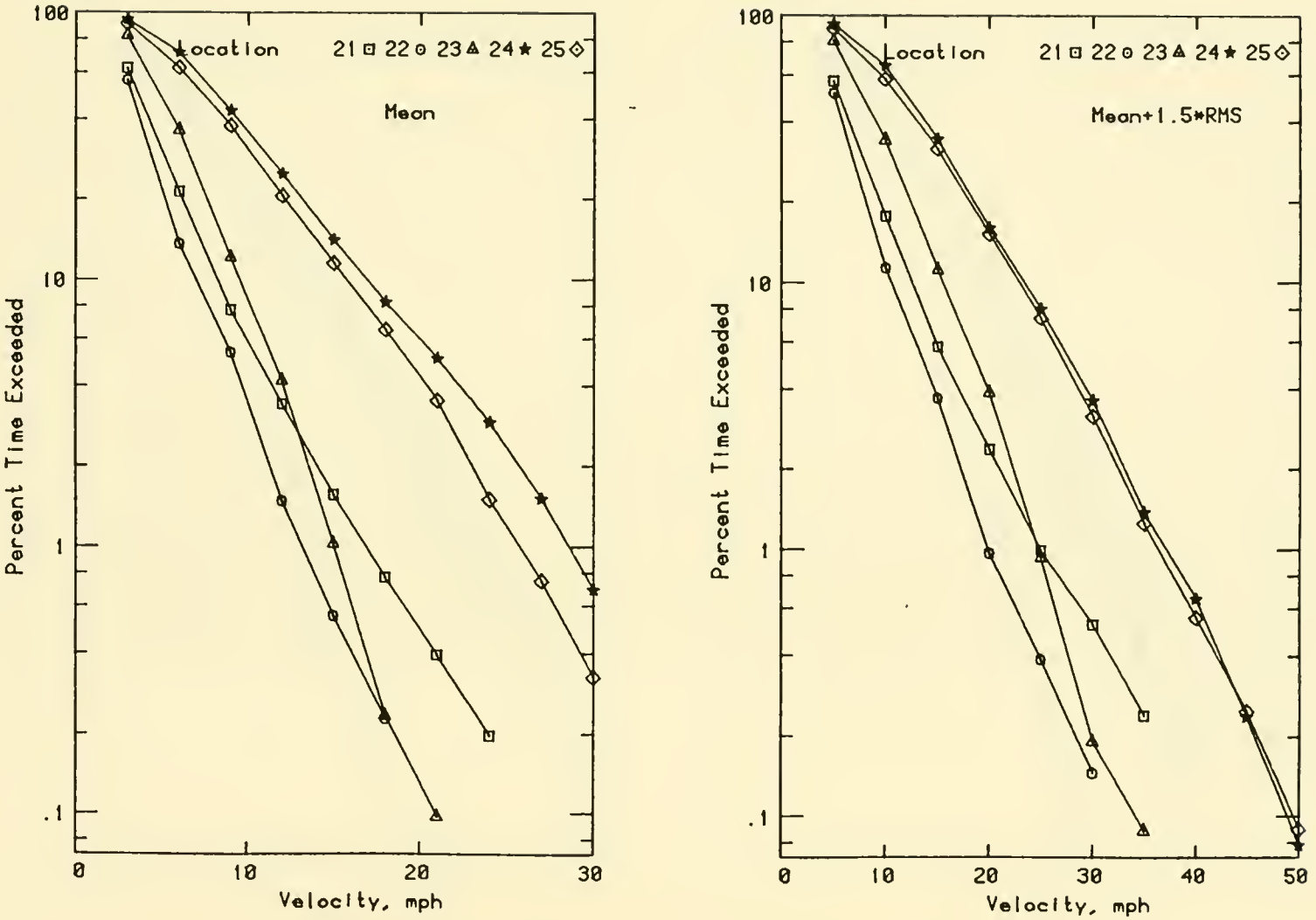


Percent Time Exceeded for PH1 Configuration

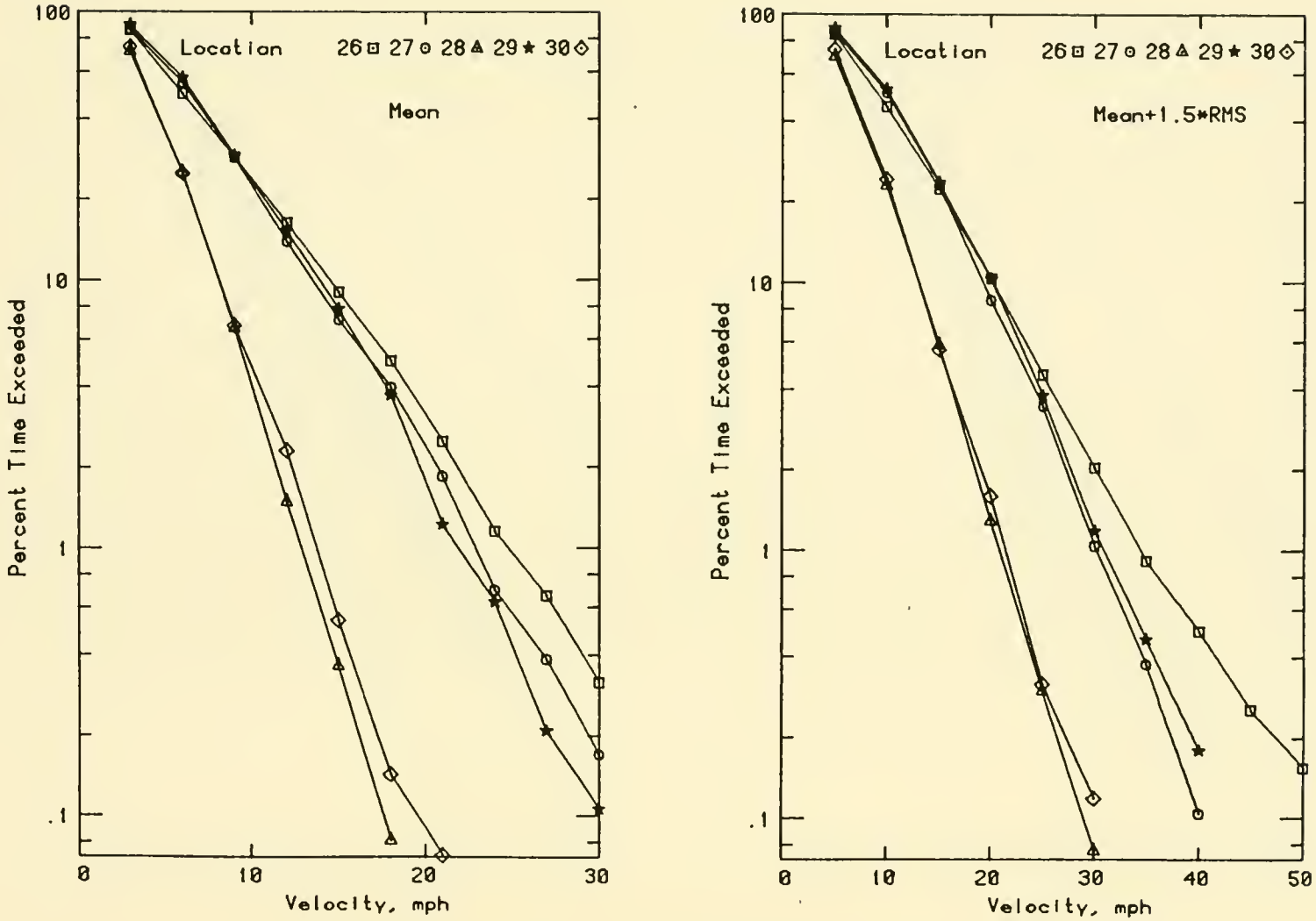




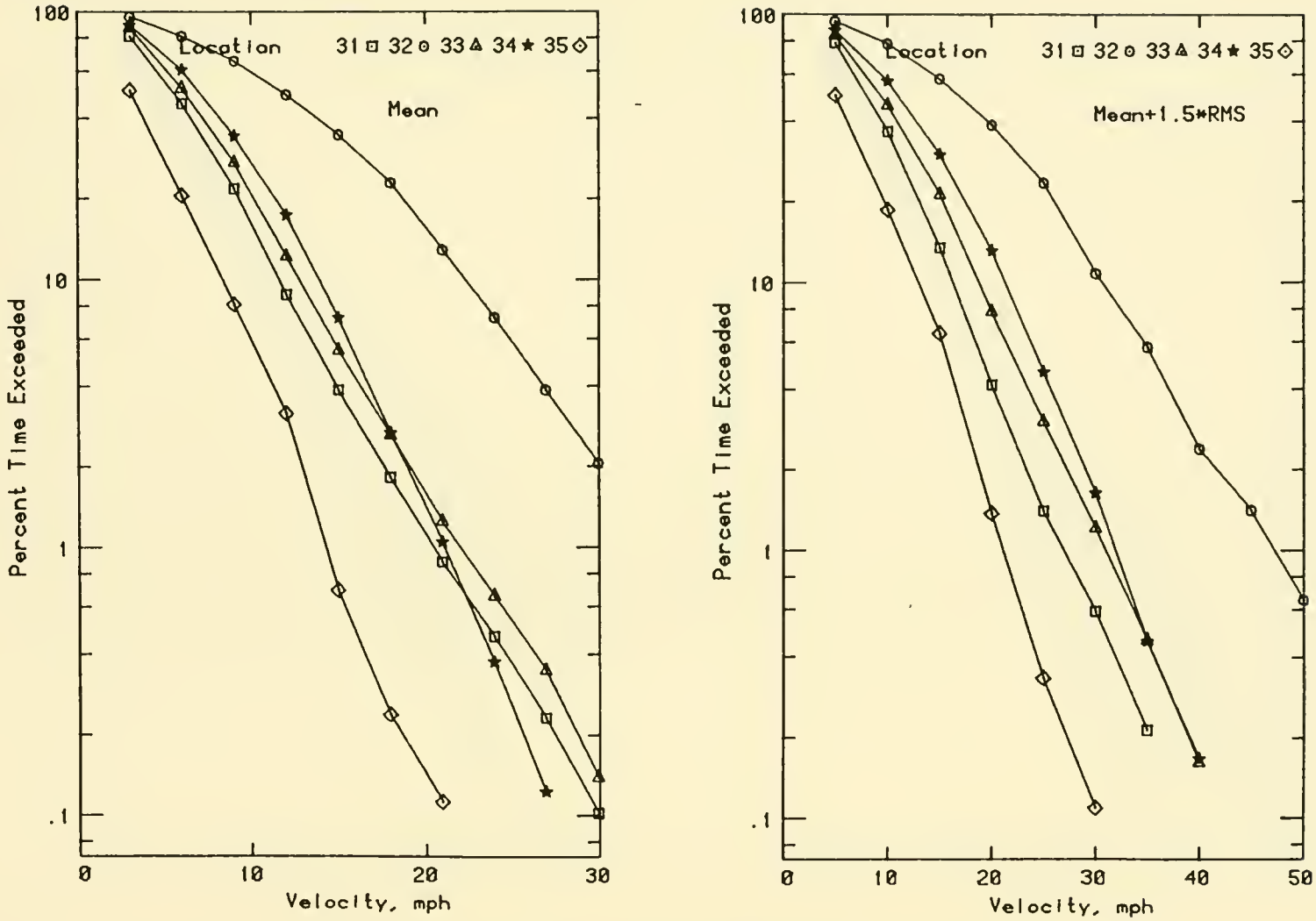
Percent Time Exceeded for PH1 Configuration



Percent Time Exceeded for PH1 Configuration



Percent Time Exceeded for PH1 Configuration



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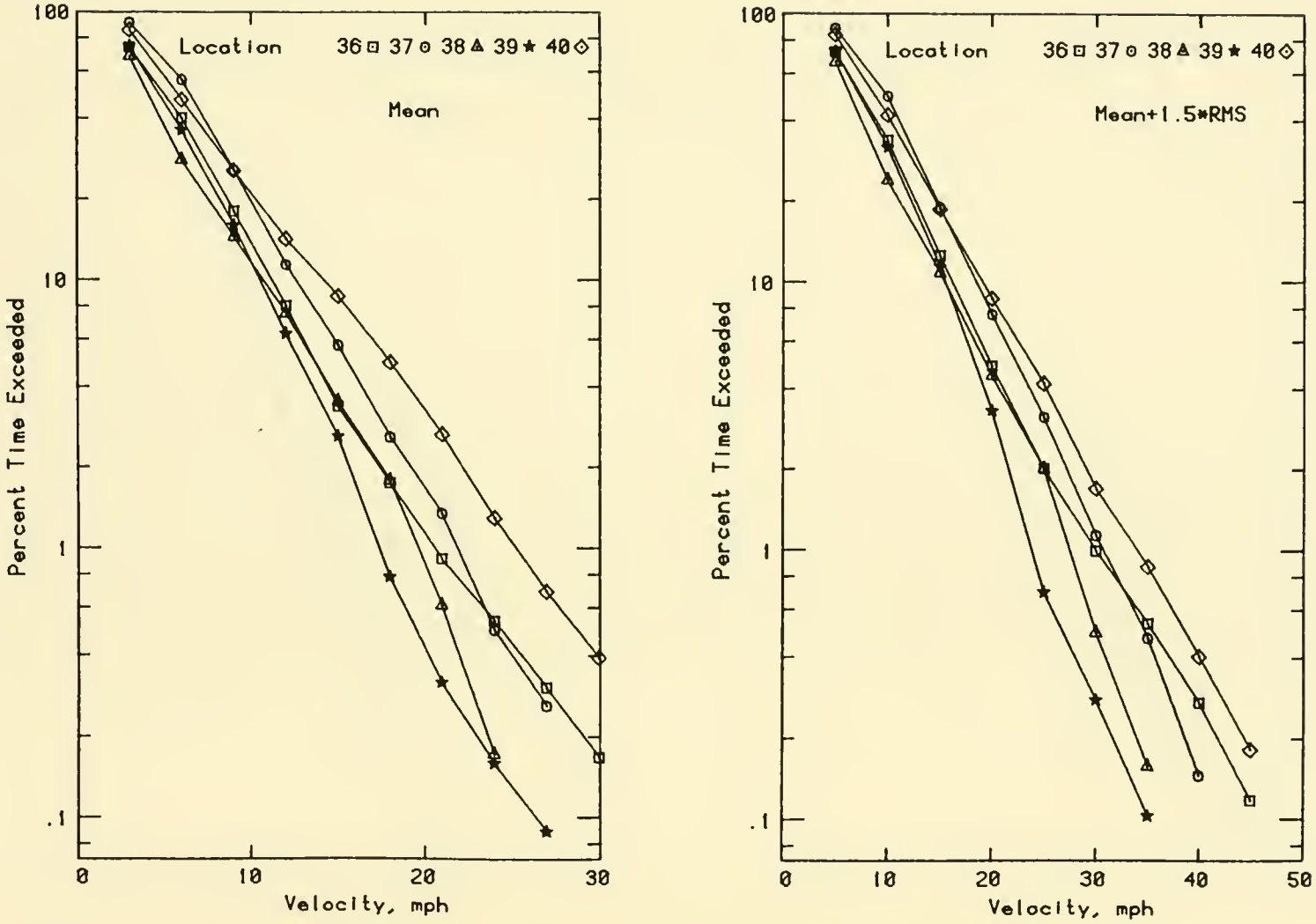

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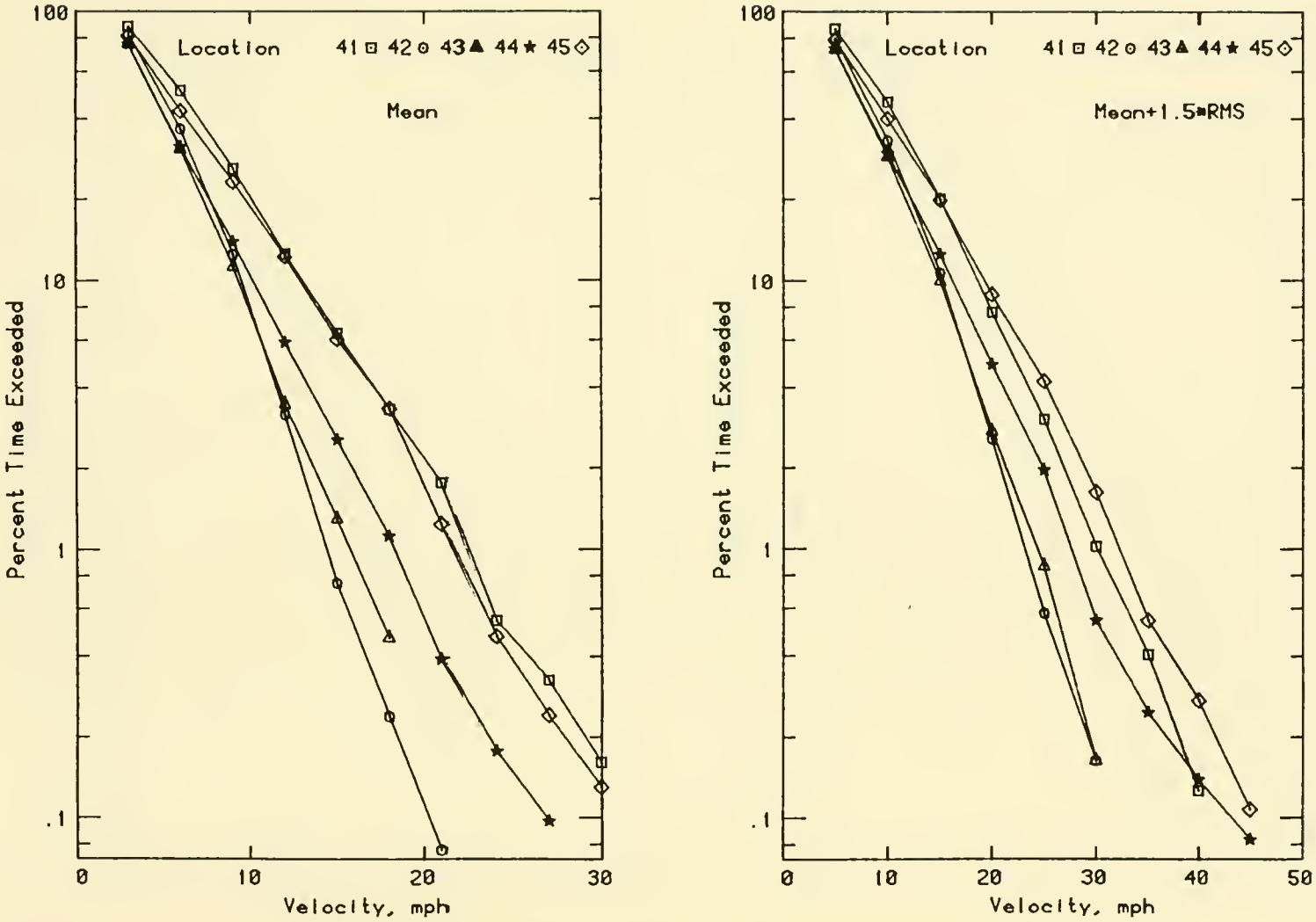

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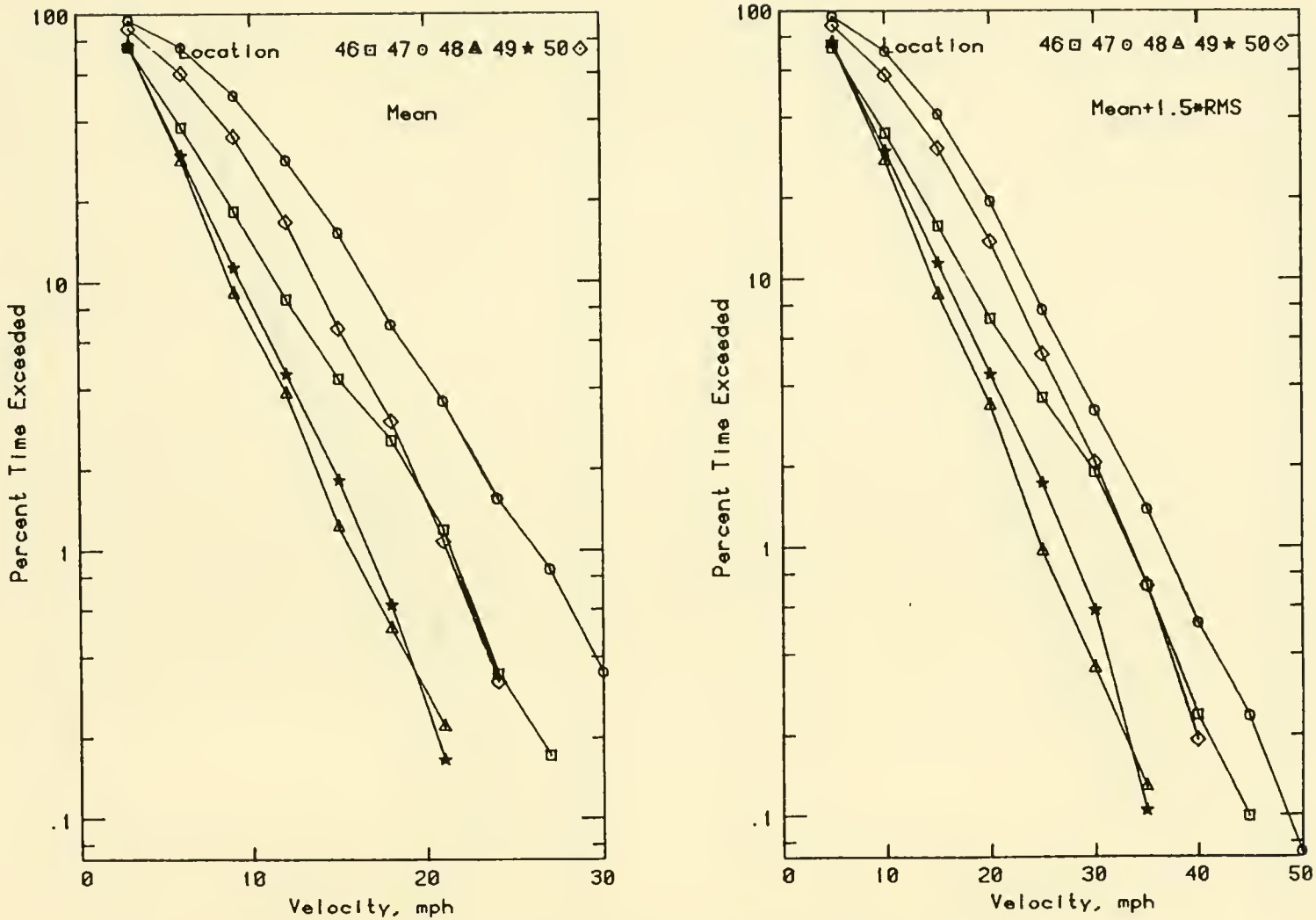
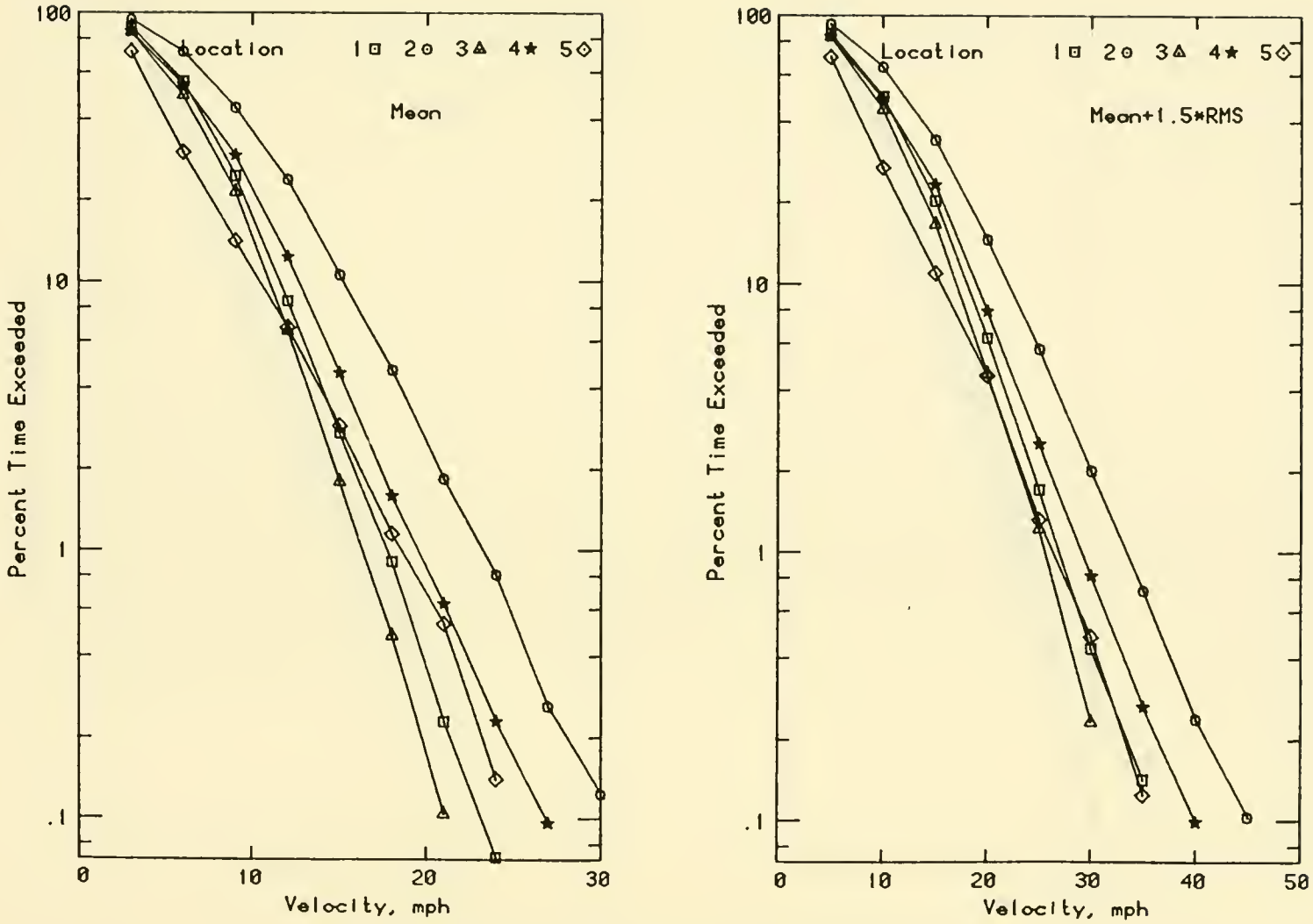


Percent Time Exceeded for PH1 Configuration



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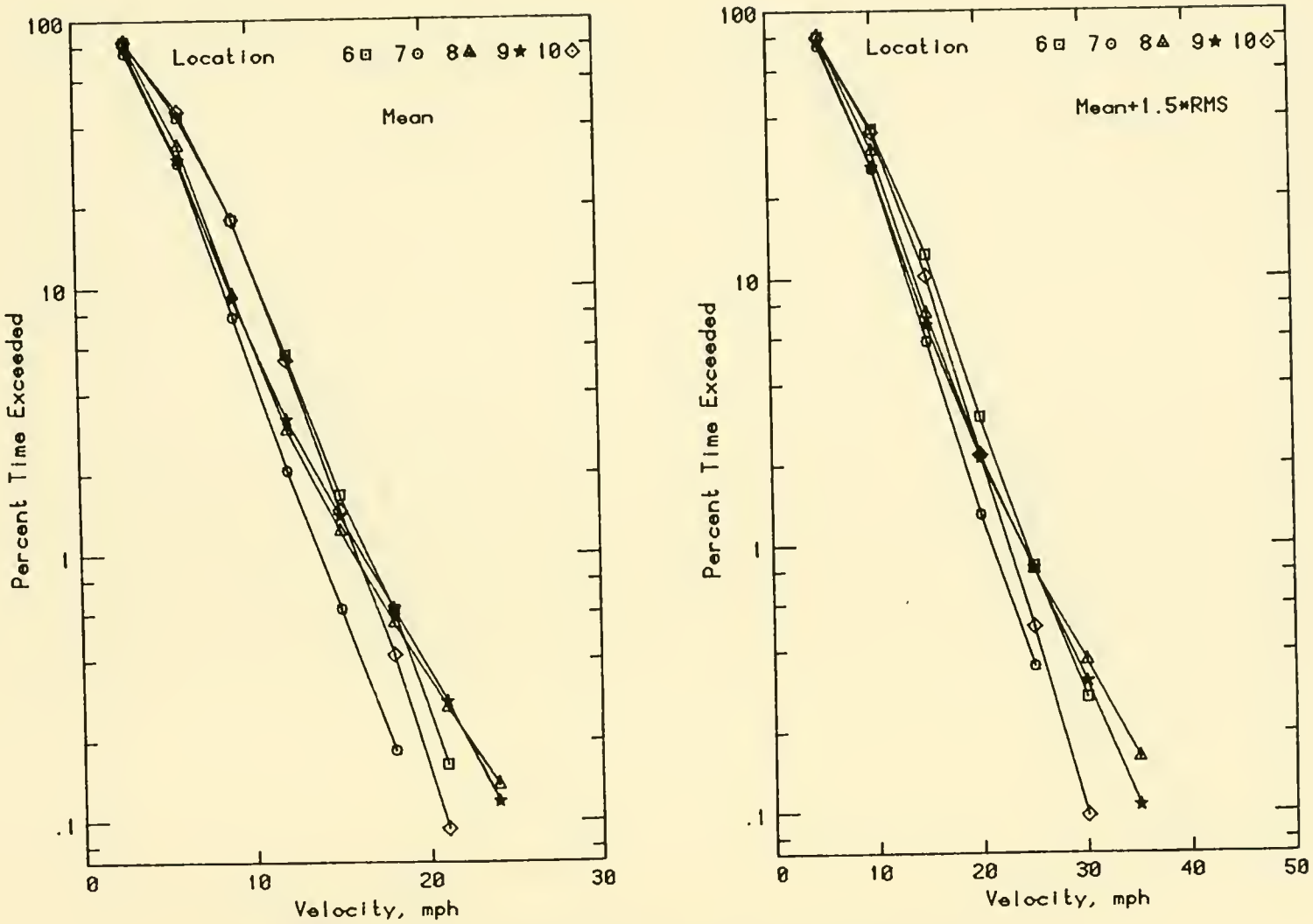

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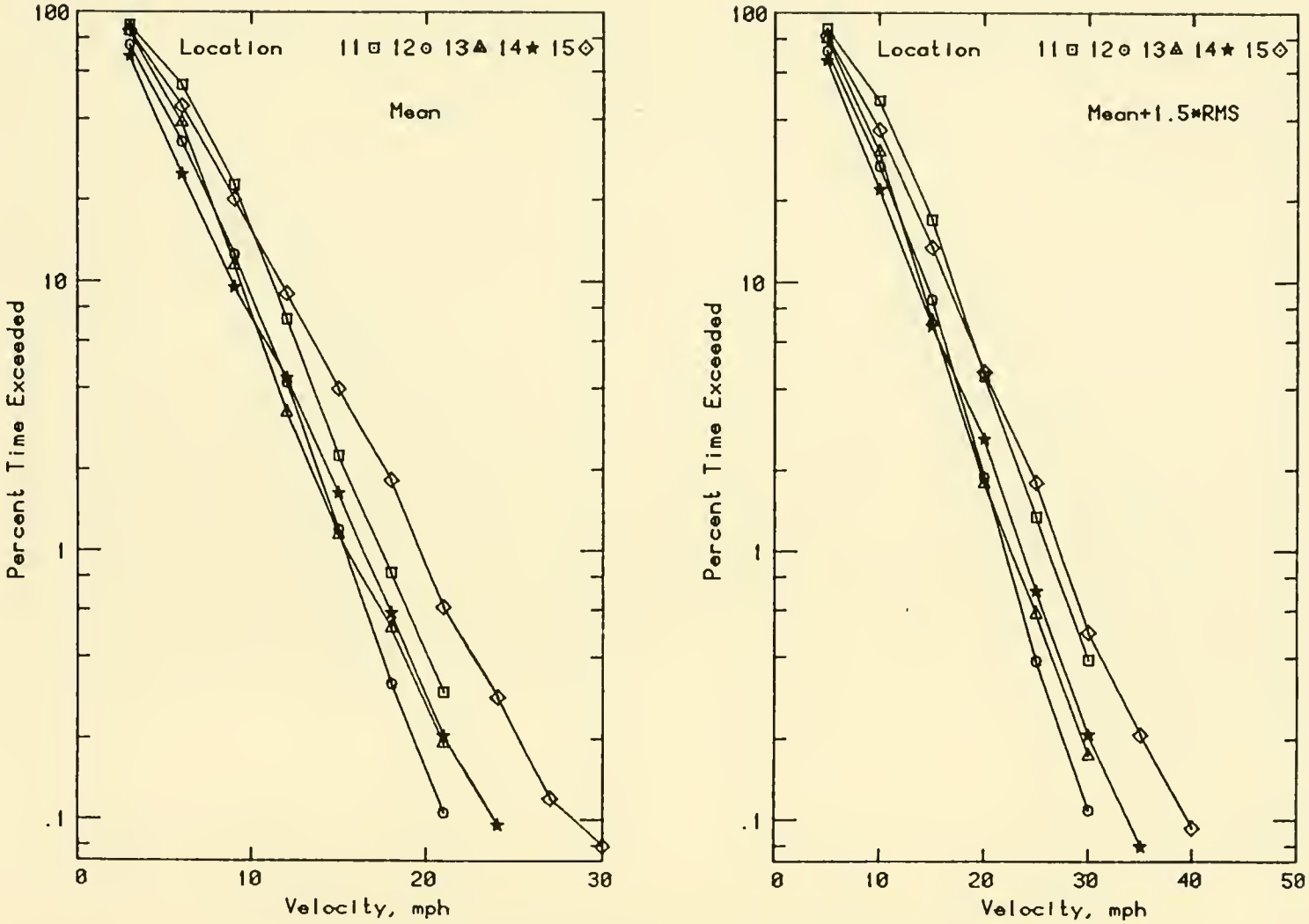

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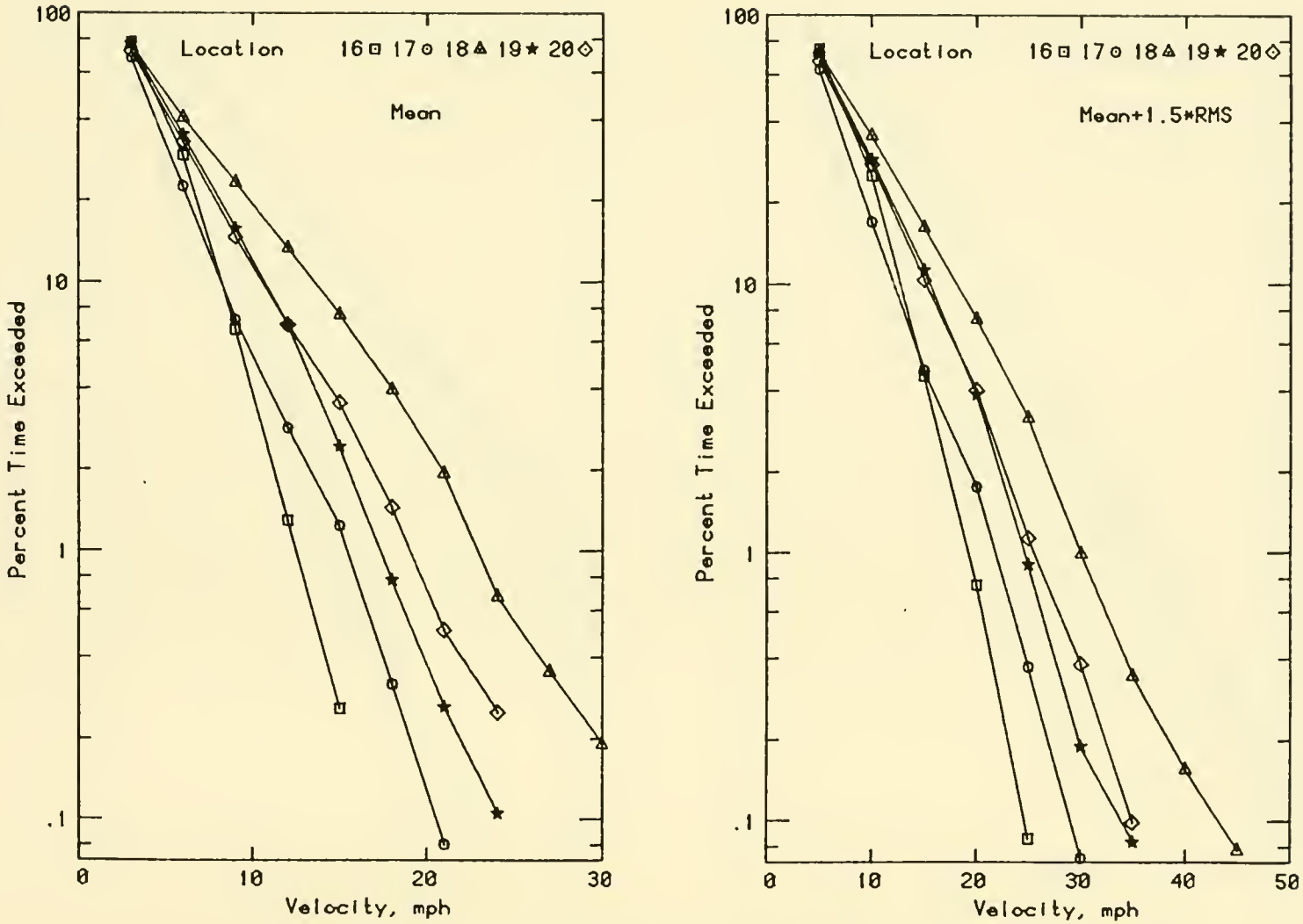

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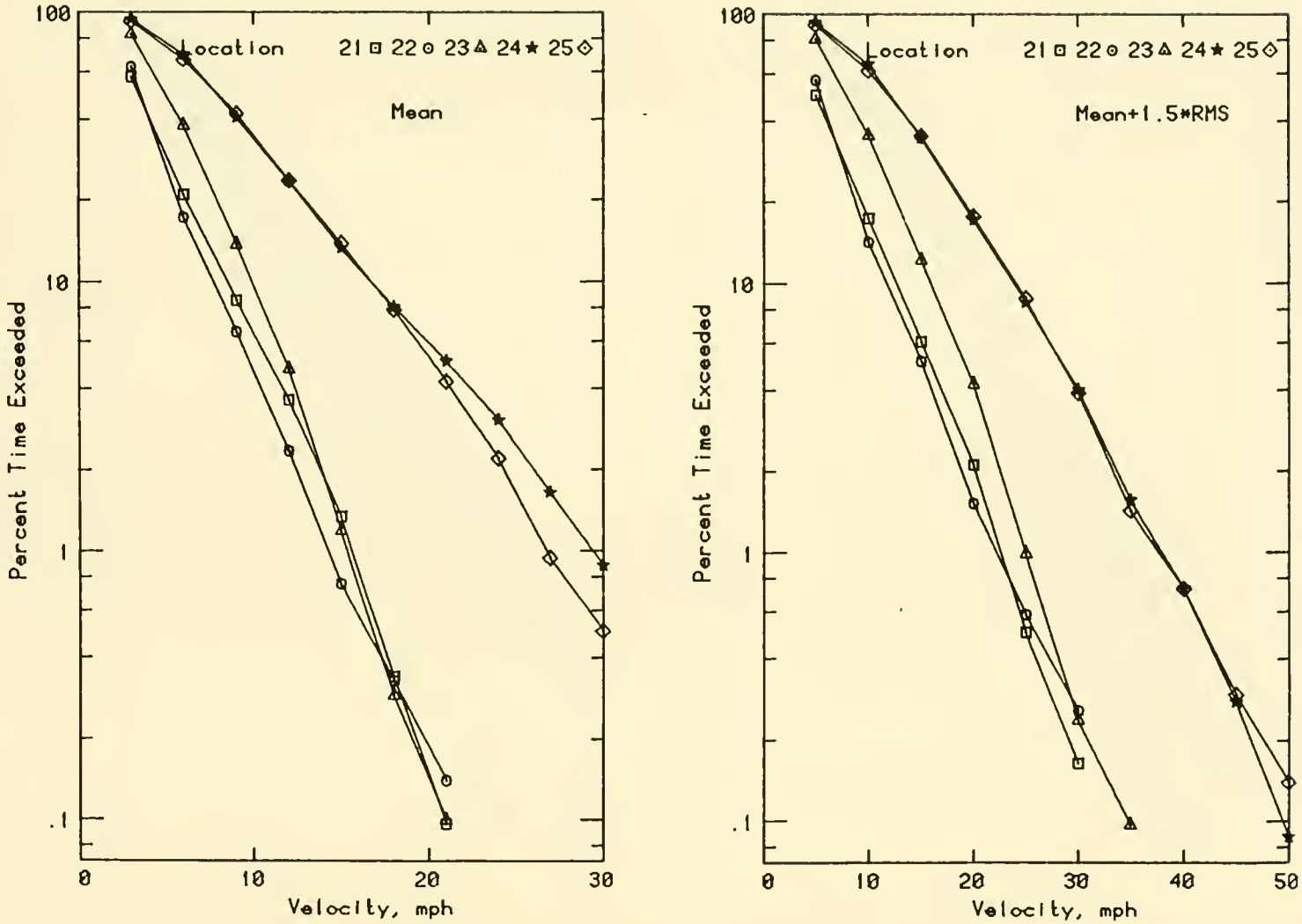

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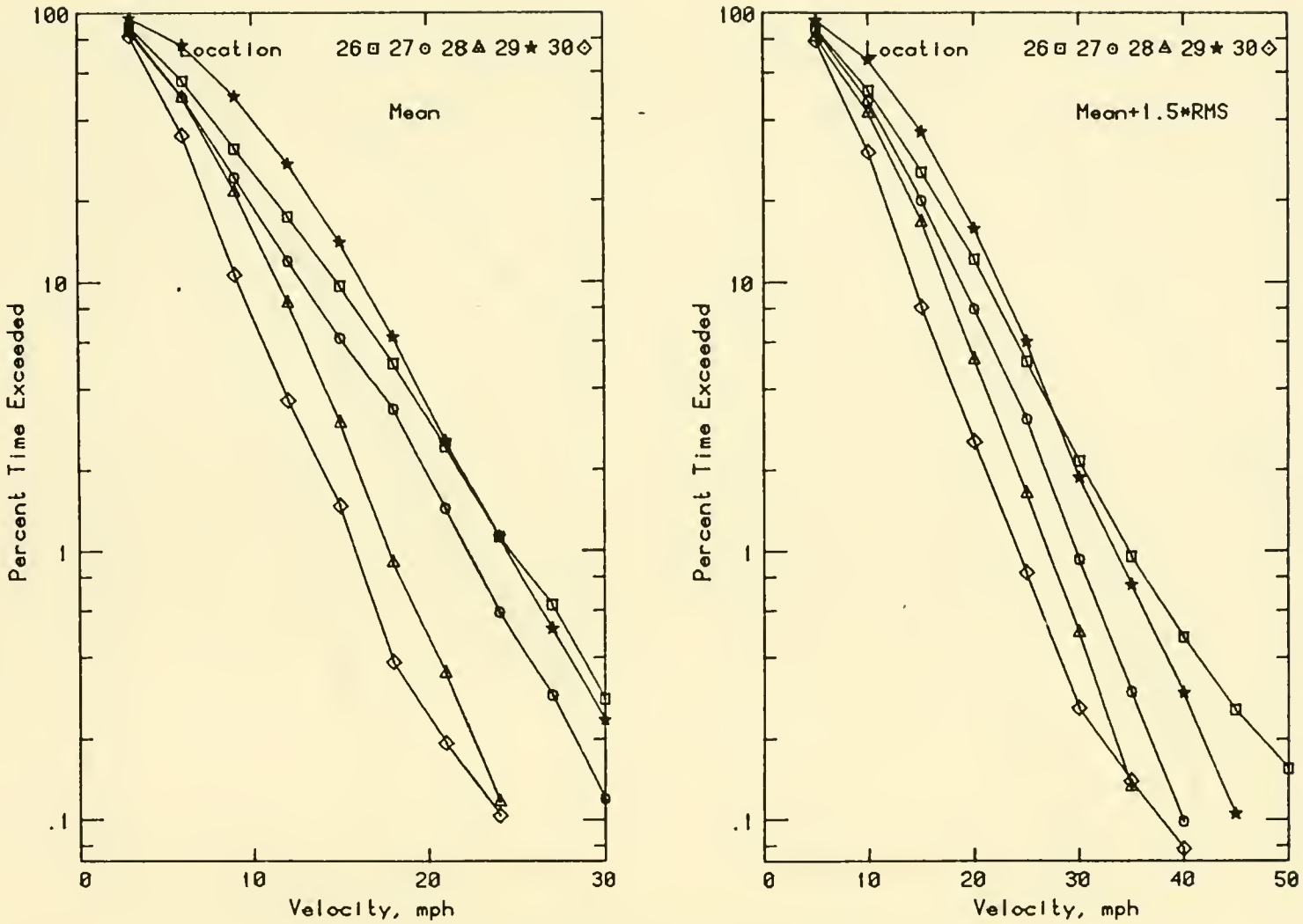

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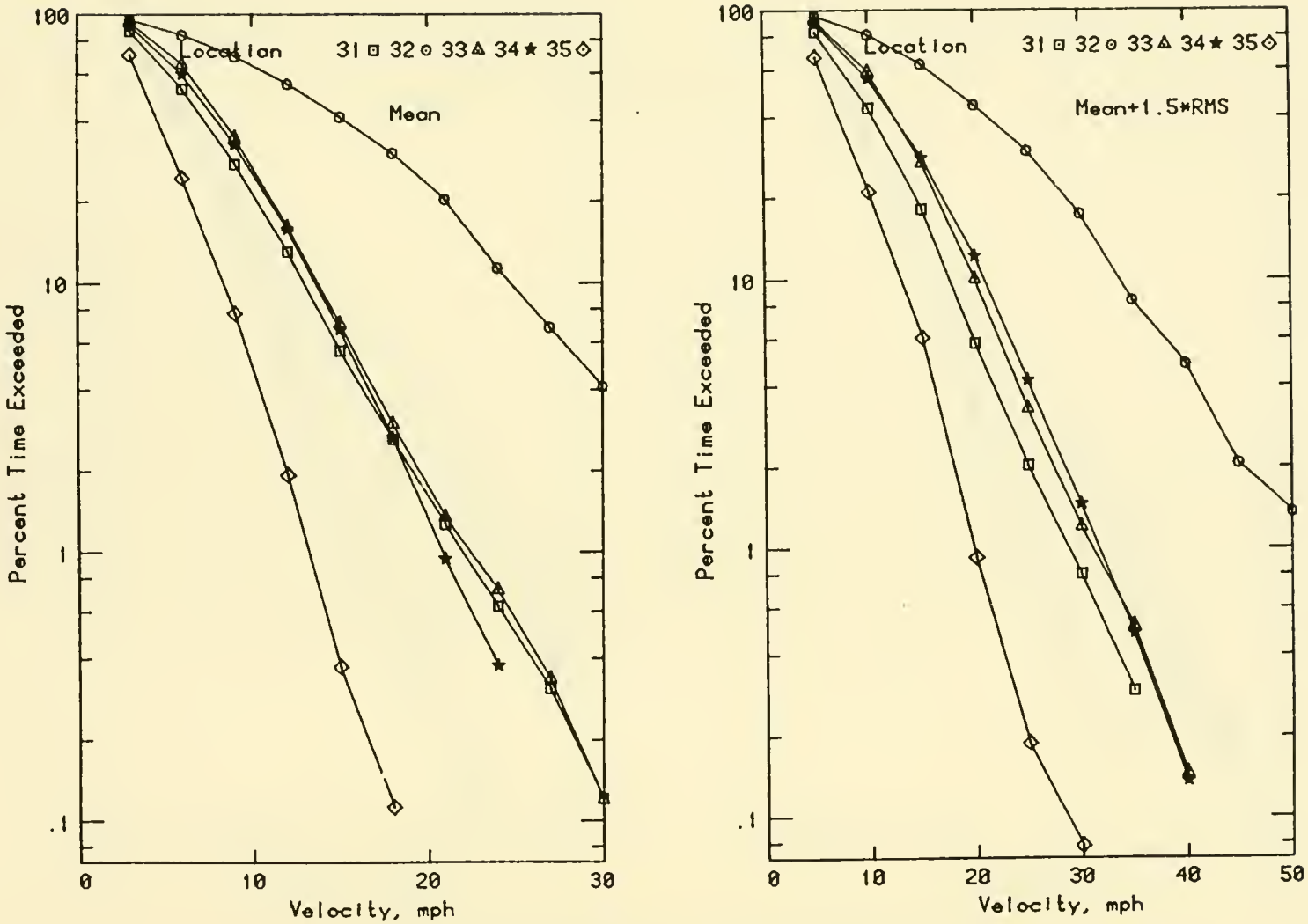

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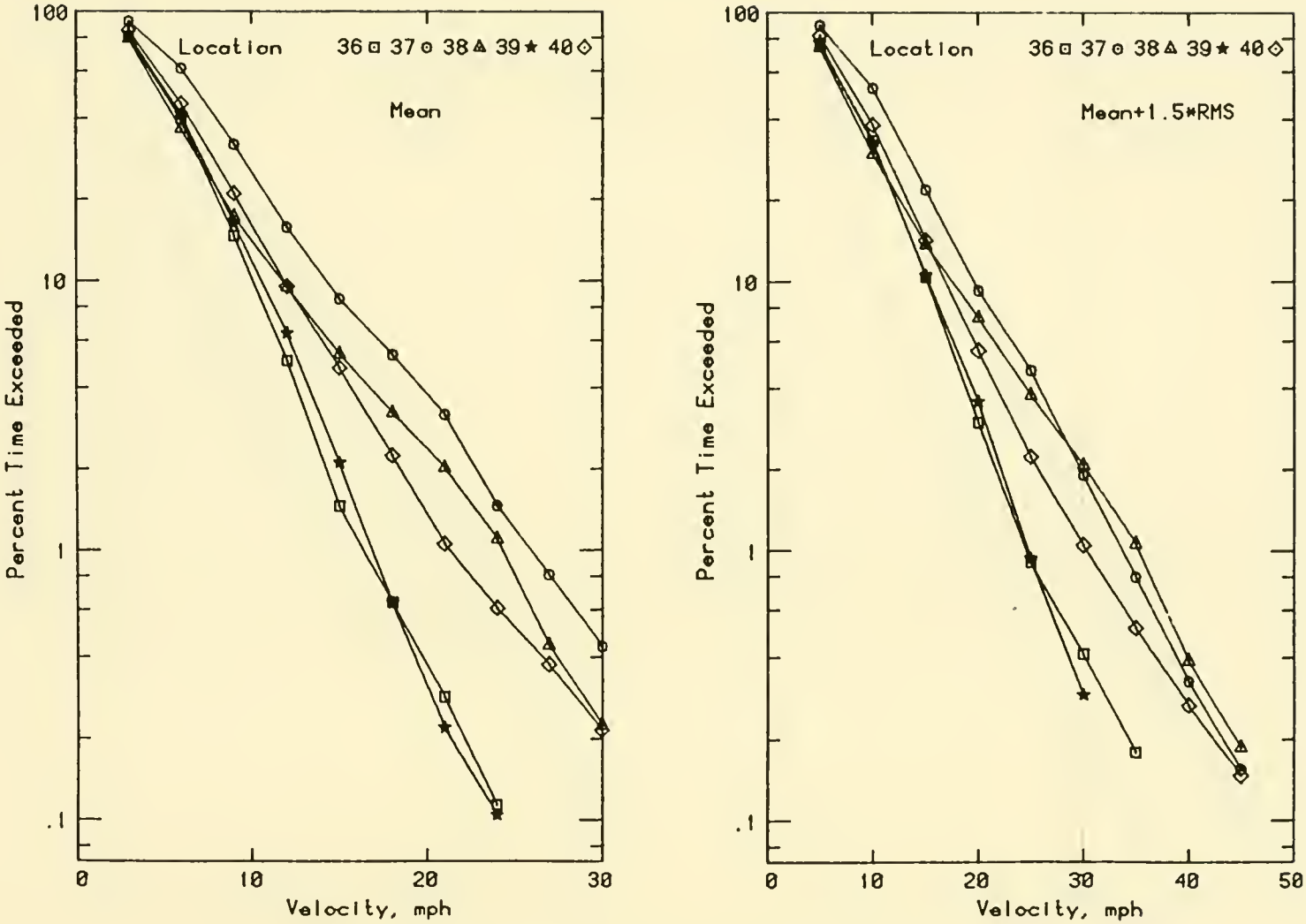

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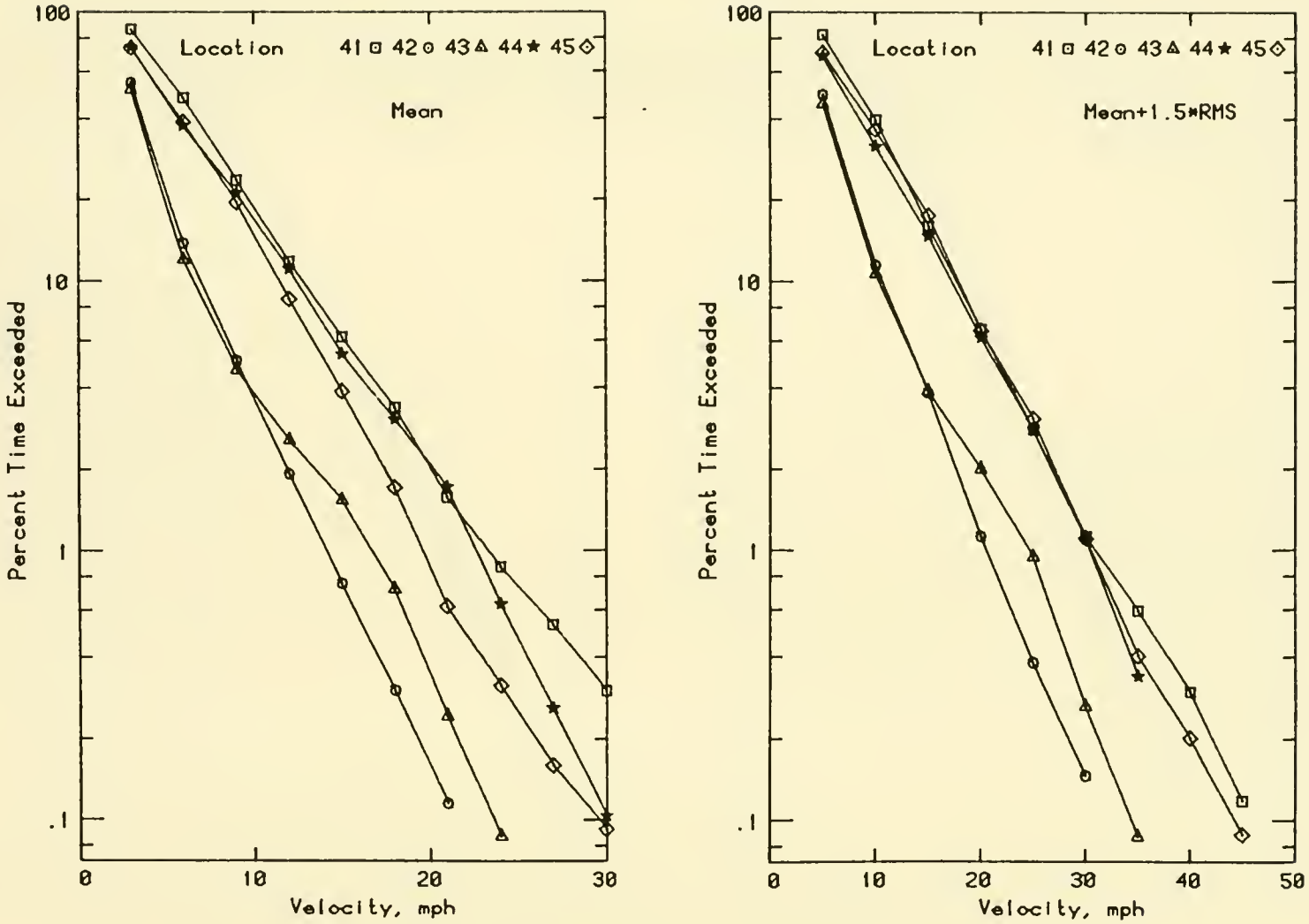

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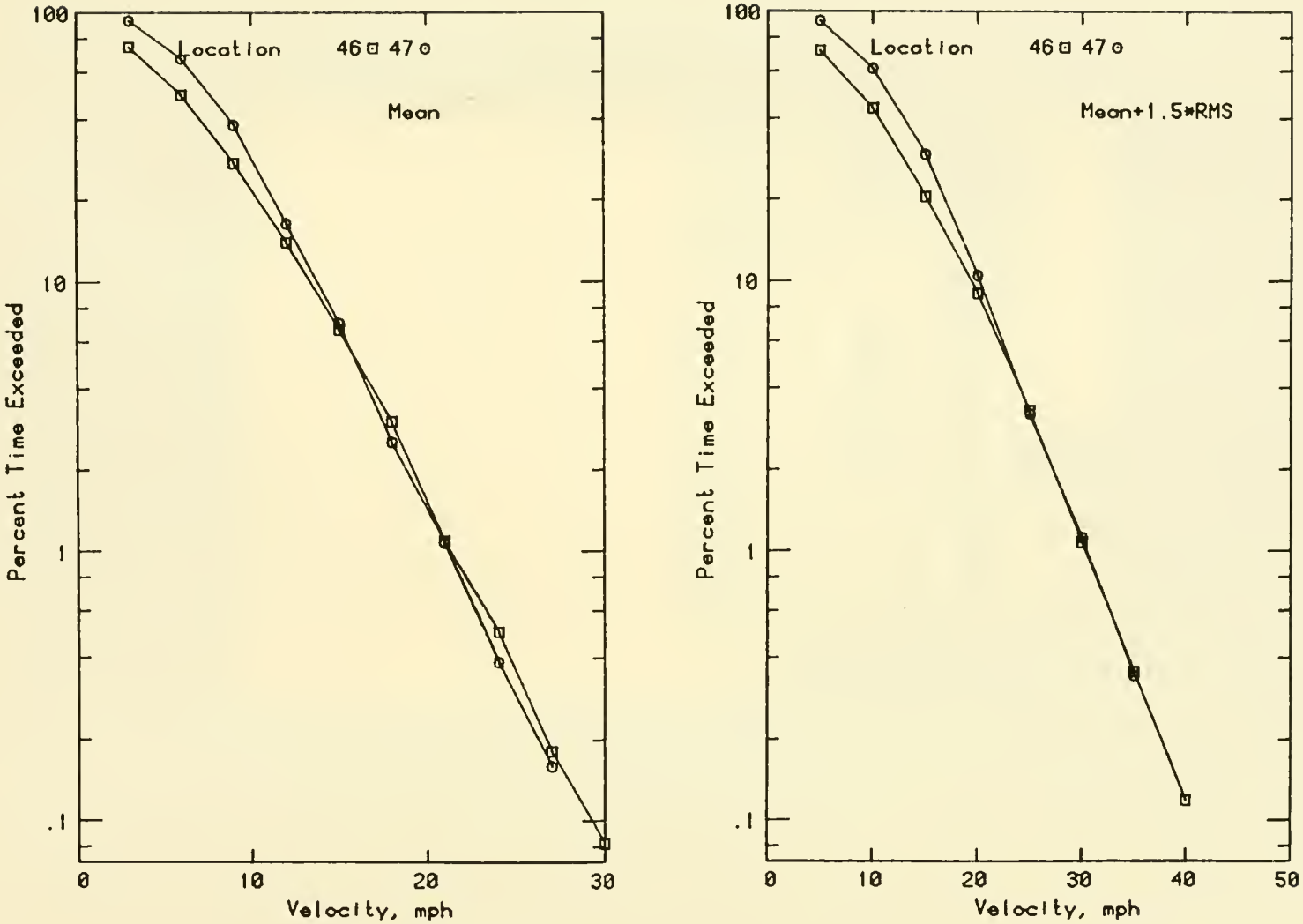

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